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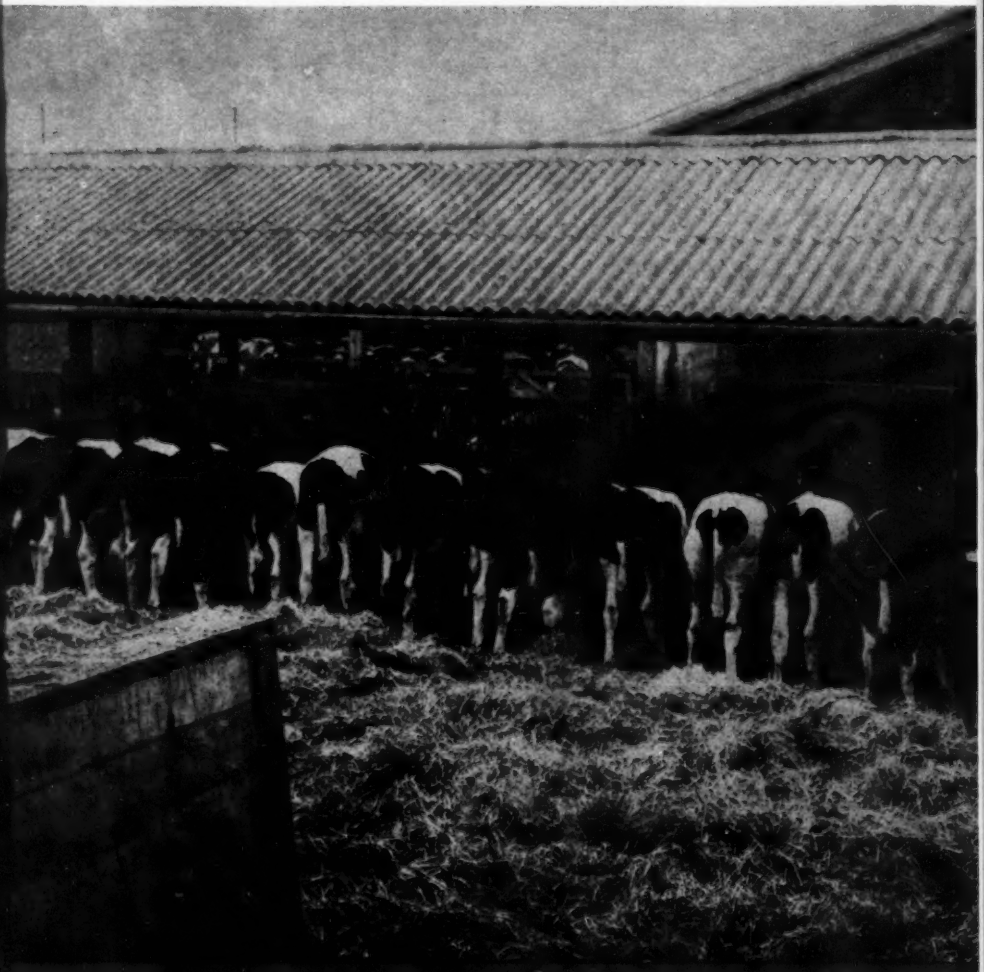

George Barker of Thornborough Farm, Northallerton, Yorkshire and Dave Martin and Glyn Williams of ICI.

"ICI reckon late bite pays off and I can prove it for them."

George Barker speaking: As a dairy farmer whose biggest problem is to keep feed costs down, I'm prepared to work a good idea hard if there seems to be a profit in it.
Glyn Williams has for a long time been enthusiastic about late bite and his local colleague, Dave Martin, is equally keen. From my experience over the years I knew they were talking good sense.
My farm is 112 acres and last Autumn I was grazing 82 cows and 26 bulling heifers. From August 1st to September 9th I applied a total of 12 tons of 'Nitram' to 100 acres. 'Nitram' being very concentrated (34.5%N), it worked out to 82 units (less than 2½ bags) per acre overall. I was hoping for big things!
In the event I did even better than I expected to. I got full grazing for the whole herd right to mid-November and I saved a lot of money in supplementary feed.

Late bite with 'Nitram' certainly did pay off. My milk production in the period September to November was 22,269 gallons. Total milk receipts were £3,856 and total concentrate costs were only £858, leaving me with a margin over concentrates of £2,998. Not a bad performance for the cost of a late dressing of 'Nitram'.
There will be another 20 cows in the herd this year and I am definitely going for late bite with 'Nitram' again.
I am ordering this and all my fertilizer earlier this year. As I said to Dave and Glyn, 'Nitram' is a good investment at any time, but if I can get it cheaper earlier, so much the better.

Your ideas grow with the fertility people

ICI

Contact your local ICI representative or appointed merchant.

Please mention AGRICULTURE *when corresponding with Advertisers*

Agriculture

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W. Emrys Jones

writes about

A.D.A.S.

the new

AGRICULTURAL DEVELOPMENT AND ADVISORY SERVICE

'Farming was so much simpler ten years ago; it's simpler today than it will be ten years hence.'

Farming for Profit—Dexter and Barber.

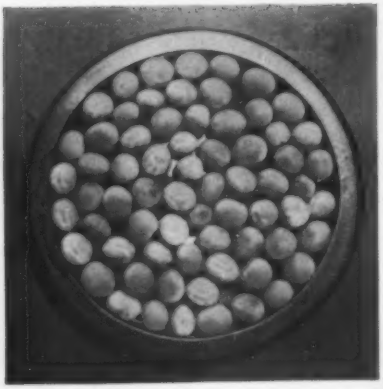
Modern market requirements, farm finance and industrial management concepts are all playing an ever increasing part in determining policy on the farm. In recent years the business approach to farming has brought about a notable change in attitude by both farmers and landowners, who now expect to be acquainted with the economic significance of the advice they receive. For the N.A.A.S. and A.L.S. this has meant a gradual move towards a common ground in such matters as the use of capital, the design and efficiency of farm buildings and many other aspects of farm management.

This merging of interests has been given further impetus by the need to consider individual farming decisions within the context of an overall farm policy. The economic pressures and the capital intensive nature of modern agriculture have forced many farmers to deviate from traditional farming practice, often leading to new and complex biological problems as well as intricate financial situations. As systems of farming have become more intensified, soil management, crop protection, animal behaviour and housing have become increasingly inter-related. In these ways, and in many others, the main arms of the Ministry's advisory services have been moving closer and closer together. It is consequently a logical development that the Minister should announce, as he did on 6th August 1970, that the separate disciplines of the Ministry's professional and technical services should be merged into a unified service—the Agricultural Development and Advisory Service—which will become operative from 1st March 1971.

The Minister has stressed that unification of the Services will in no way impair the integrity and independence of the advice at present received by the farmer. As the first Director General of the new Service I wish to reaffirm that assurance. In the same way, when farm business information is passed to advisers the confidentiality of that information will be respected as it always has been.

The basic principles of the unified service have now been resolved but there remain many details to be worked out. The aim will be to create a service that will be better equipped to tackle the emerging problems of modern farming.

When all the details have been worked out we shall be publishing them in this journal. We will also be letting individuals—inside and outside the new service—know how the changes will affect them.



Pauli variety

The Director of Research at the P.G.R.O. discusses the changing scene in production and consumption of

Dried Peas

A. J. Gane

DRIED peas, either as a crop or as a vegetable, are perhaps not everybody's choice. Yet there is no doubt that despite the introduction of various methods of preserving 'fresh' vined peas, the national consumption of dried peas has hardly changed for many years. The British market absorbs about 100,000 tons a year, sold loose, in packets, and canned as 'processed peas'. Part of this tonnage is the Dutch marrowfat, part Alaska blues imported from the United States, with the balance produced in this country.

Home production

The fortunes of the dried pea crop in this country have changed markedly over the years. In 1939, 19,000 acres were grown; by 1944, the year in which the Home Grown Threshed Peas Joint Committee—forerunner to the Pea Growing Research Organisation (P.G.R.O.)—was formed the acreage had increased to 105,300. A peak of over 180,000 acres was reached in 1948 and again in 1949 but from that time there was a period of almost uninterrupted decline until 1963 when the acreage at 22,000 was down almost to the pre-war level. Since then, there has been a substantial recovery.

Although on the one hand the British consumption of dried peas has varied little, the acreage grown has varied very greatly, the balance of our requirements being made up by imports.

The downfall of our dried pea acreage was due to a combination of factors, including the increasing availability of contracts for vining peas, the harvesting of which is much less dependent on dry weather, and the availability to the processor of large quantities of imported Alaska peas. The latter often presented fewer technical problems in the factory and, broadly speaking, were more uniform than our own product.

Advances in advice

An increasing need for break crops then gradually developed and, since applied research on all aspects of pea growing and harvesting continued unabated throughout the years of low acreages, growers soon found that many of the problems of earlier years had been overcome, or at least very greatly reduced. As a result, they could regularly obtain yields which previously were rarely achieved.

For example, it was during the years of lower acreages that the P.G.R.O. carried out its extensive investigations into the control of wild oats in peas. This was a problem which had been studied closely for eleven years and which can now be avoided or overcome on almost any soil. It was during the same period that the importance of plant population, as opposed to seed rate, was fully explored; from this was developed the now well-known P.G.R.O. theme of optimal population 'calculation, achievement and protection'.

The pea grower is now supported by a more complete research and advisory service than ever before. Not only can he call for help at the first signs of problems arising but the chances are that he, his merchant or processor will have been trained through P.G.R.O. to identify and deal with a wide variety of such problems. He will even be warned of the likelihood of an attack by a pest or disease before it takes place. The services of this nature which the P.G.R.O. aims to provide are intended to reduce the risks involved. It is at least in part because of risk reduction that many searchers after break crops have turned to, or have returned to, dried peas.

Varieties

Compared with vining peas there are very few varieties used in the production of dried peas. Among the well-known marrowfats of the recent past, in order of 'succession', have been Harrison's Glory, Zelka, Big Ben and now Maro. One on the way towards commercial production which proved interesting in P.G.R.O. trials is Greengolt, which has an exceptionally dark green seed. Sleaford Dryad is also promising, although at a somewhat earlier stage of development.

Two large blue varieties of long standing are Pauli and Rondo, while Dik Trom is a comparative newcomer from Holland. These and other varieties are assessed in trials for yielding ability, ease of harvesting, disease resistance, and many other qualities.

A variety which has shown particular promise has been Vedette, and the results obtained have already been published. This was one of twenty-six varieties which were studied as possible British-grown replacements for at

least some of the substantial imports of Alaska blues; for it had become quite clear in the later '60s that there was a need for British farmers to grow a higher proportion of the national requirement of this type of pea.

Well filled pods

Replacing imports

Alaska blues have long been used in large quantities by many processors, and it is natural enough that there should be a certain amount of reluctance to change. Nevertheless, if Vedette becomes available in suitable quantities of good quality, and at a price competitive with Alaska's, a change is likely to be made. There is no doubt that the vast majority of samples of home-grown Vedette processed by P.G.R.O. have been of a quality superior to the majority of canned imported Alaska peas sold over the counter at the present time.

From the point of view of the grower, Vedette is not an exciting pea as regards yield, but its growth habit is so different to other varieties that it is far easier and, therefore, cheaper to harvest. The acreage of Vedette being grown depends of course upon seed supplies, especially in view of the fact that the variety has only recently been discovered as a replacement for Alaska imports. The acreage being grown in 1970 cannot be assessed with accuracy, but it is probably between 3,000 and 5,000. It remains to be seen what the growers of such an acreage find the profitability to be, and it remains to be seen also whether the interest they have clearly shown is to be matched by the processing industry. If both are satisfied, then our acreage of dried peas is likely to expand further still, at the expense of imports.

Production trends

The 1970 national acreage of dried peas is also not yet known, but it could well be in the region of 70,000. Within this figure lies a substantial increase in marrowfats, and this poses the question, 'is this to be matched by a showing of greater interest by processors?'. Once in this field we are faced with 'consumer preference', established 'brand images', and so on.

There is no doubt that acreage, production and consumption figures need watching carefully. There is a danger of over-production which, in the long term, is in the interests of no one. It must be borne in mind that the peak years of 1948 and 1949 are now twenty years ago; there have been many advances in pea growing since then. The national average yield for the five year period 1948–1952 was 0·76 tons per acre, while for 1963–1967 it was 1·28 tons per acre. Such figures must be interpreted with caution, however, since the areas in which dried peas are grown have also changed. Broadly speaking the trend has been for the crop to be retained in districts of higher fertility and this in itself is clearly a factor in the increased average yield. Generally, however, it seems that we now need a very much smaller acreage of dried peas than before to produce 100,000 tons of produce; the exception to this is Vedette, which is a variety apart whose future is likely to be decided this season.

The production per acre of *usable* dried peas has also increased and is likely to increase still further in the next few years. Increasingly efficient control of weeds and pests obviously reduces the proportion of stained and damaged peas, and current research with new fungicides is likely to reduce the incidence of staining still further. The results of P.G.R.O. work in which fungicides have been applied to the crop have suggested that such treatments may effectively reduce the incidence of stain-producing fungus diseases, such as leaf and pod spot (*Ascochyta spp.*), to such an extent that they would pay well.

In short, there is much to be said for growing a reasonably high proportion of our total requirements of dried peas. But we must not lose sight of the fact that the yield per acre of usable peas is far higher than it was twenty years ago and is still increasing, and that in consequence our acreage requirement must be related to today's capabilities.

A better future

We, therefore, find ourselves at an interesting stage in the development of the dried pea industry. A time of increased reliability of crop, with new aids to greatly cut down, if not cut out, many of the traditional risks associated with it. We have the need for break crops, amongst which dried peas is surely one of the most beneficial and at the same time one of the most profitable. We have a processing industry which has to some considerable extent become accustomed to the bulk buying of Alaska peas from abroad, but which is now faced with the possibility of comparable, if not better and more competitive, produce becoming available at home.

There is no doubt about the interest being shown by all concerned, and only time will tell the outcome.

This article has been contributed by **A. J. Gane, C.D.A., F.R.M.S., F.R.S.A.,** who is Director of Research at the Pea Growing Research Organisation at Thornhaugh, Peterborough.

If we wait to afford to conserve there will be nothing left that is worth conserving.
Paul Wix, Assistant Editor of the British Bee Journal, discusses

Conservation and the Beekeeper

'And spreading Lee Close Oak, ere decay had penned its will
To the axe of the spoiler and self interest fell prey.
And Crossberry Way and Old Round Oak's narrow lane
With its hollow trees like pulpits I shall never see again.
Enclosure like a Buonaparte let not a thing remain.
It levelled every bush and tree and levelled every hill,
And hung the moles for traitors, though the brook is running still
It runs a naked stream cold and still.'

(John Clare 1793–1864 M.S. Poems—Remembrances)

So wrote John Clare the Northamptonshire peasant poet when enclosures were altering the face of the countryside. He mourned the loss of his forests to agriculture in the way some twentieth century men mourn the loss of agricultural land to urban needs.

Conservation consciousness

Certainly the impact on wild plant and animal communities is greater today than in Clare's time, and gives rise to concern. Traditional forest management of that period, known as coppice with standards, provided a set of conditions suitable for a very diverse flora and fauna not far removed from a natural state. Linear coppice with standards subsequently grew to form the post enclosure hedgerows which maintained a balance unforeseen by Clare. This pattern has thus become traditional and the removal of miles of hedgerow to increase efficiency is causing disquiet amongst today's naturalists who see a further reduction in diversity of habitats for wild species. Views not far removed from Clare's sentiments are frequently expressed at the present time.

Such phrases as 'quality of life' and 'need for conservation' imply an inner desire by many for a balance to be maintained, even if some efficiency is lost. The view that if we wait to afford to conserve there will be nothing left worth conserving sums up today's conservation consciousness. If the next generation were brought up to a 'prairie' countryside they would doubtless accept it as traditional, but there is evidence that the current agricultural revolution may be the most short-lived in history. There is increasing concern lest our generation with the destructive capability of machines should be considered as agricultural Philistines, just as the Victorians are now regarded as industrial Philistines in their treatment of resources and their lack of concern for blight and pollution.

The banning of certain pesticides and criticism of hormone sprays not only negates technology but also increases public concern about their use. It is imperative to ensure that some areas are kept free of treatment through conservation schemes.

Naturalists point out that when hedgerows are removed some birds can move to the new coppice with standards of surburbia—shrubs with fruit and ornamental trees. This certainly is possible for many species, yet for a large number of plants and the food they represent for insects this is not so.

Man has, however, a deep involvement with trees, probably surviving from our dependence on them in more primitive times. Many new householders have a desire to convert gardens into miniature forests in which to hide in much the same way as primitive forest dwellers. Open plan estates contradict this deep desire and this fact has been discovered at some cost. It is certain that hedgerow standard trees need a lifetime to replace and should not be removed where they have amenity value.

Beekeeping interests

Beekeepers represent a special interest group in so far as trees which provide forage for bees are worth planting. Tree planting has assisted beekeeping in suburban areas much more than in some country districts. This has caused concern as the recent increase in crops needing pollination has not been balanced by an increased population of bees. In fact, in highly intensive arable areas, where pollination need has increased with new break crops, the concentration of colonies has tended to fall. Removal of so called waste areas has reduced the nesting sites for wild bees.

Orchards and the arable flowering crops, brassica seed and beans, provide forage at specific times of the year. These areas may not be capable of maintaining large bee populations all the year round so the need for migratory beekeeping arises. Hobby beekeepers, who own the majority of colonies, have little wish to hazard their stock although many would consider setting up permanent out apiaries on arable sites if they could be maintained through the year and given reasonable protection from spray damage. There is no doubt that co-operation between beekeeper and farmer has led to some profitable results for both in recent years. Instead of helping agriculture many are tending to look at the prospects in scheduled areas, country and forest parks and nature reserves where safety is guaranteed. (See also 'Bees and Agriculture'. *Agriculture*, March 1968, p. 104).

Problems and possibilities

Redressing the balance by replanting schemes immediately conveys to many the impression of inconsistency with efficiency as seen in the principles of subsidized hedgerow removal. There can, however, be satisfactory compromise as can be seen from what has been done already.

Local authorities or private individuals may initiate Tree Preservation Orders under the Town Planning Acts 1962 and 1968 and the Civic Amenities Act of 1967. It is assumed that these orders will cover mostly in-town situations followed by town perimeter areas. From a naturalist's point of view these sites are under pressure; they are subject to too much disturbance for birds and are unlikely to maintain their spring flowering plants for many years due to thoughtless picking. Knowing their future requirement for

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agricultural land for building, there seems no reason why local authorities cannot encourage tree planting in advance. All too often the establishment of trees in a new development is ruined by vandalism. The wealthy authorities may use expensive 'instant' trees to overcome these problems.

Away from the towns the need seems to be to establish islands of plants, insects, animals and birds as an insurance against future land use. The size and distribution of such areas obviously must depend on the local circumstances. Some counties possess rare species, the location of which, for the safety of the plants or animals, is not advertised by naturalists; and some name site areas for plants without pin-pointing the spot. Naturalists knowing these locations must eventually be asked to draw up county registers of varieties and make the importance of the areas known to the owners. There are examples, of course, where constant trespass to collect wild flowers has caused owners to remove the attraction. Rubbish dumping in roadside woodlands has caused similar action, although recent improvements in refuse collection should combat this effect. The questions of crossing land, reasonable access for study and proximity to public footpaths need to be considered.

A small copse or spinney in a prairie area holds the only 'sport'; it acts as a magnet to every gun owner in the district and it is very difficult to prevent armed trespass. Vandalism, too, extends deeper into the countryside; beekeepers placing hives in remote spinnies count themselves fortunate if a season passes without a few bullet holes or close range gun blasts appearing in the hive walls. More youthful pranks include up-ending of hives. Beehive rustling reported in the last two years may indicate a market for colonies so acquired but is a form of migratory beekeeping not favoured by the owners. A regular feature of weekend beekeeping schools is an exercise on restoration or re-hiving a vandalised colony.

Having spent many years associated with beekeeping and personally trying to improve a site with bees in mind, certain observations are relevant to combining tree planting with efficiency.

1. *Shelter belts* involve maintaining the balance of nature by replacing internal hedgerow removal with the replanting of boundaries and exposed sites.

2. *Roadside* changes can best be done in consultation with local authorities with regard to traffic vision. Hedgerow removal has increased the hazard from snow drifting and if, in fact, snow is tending to be heavier and lie longer as suggested by climatologists, there is merit in preventing drifting by natural barriers.

3. *Island planting* to which difficult spots respond can become minimum disturbance areas where species and representatives characteristic of the area have a measure of safety. These spots are of particular value in so called prairie areas and could provide locations for out apiaries. In any scheme all interests can be served. Insect species, including bees, depend on plants while birds colonize the different layers as a new woodland develops. Nest boxes in young plantations bring back agriculturally useful birds to areas where nest sites in old trees have been lost.

Trees for bees

There are certain trees that are highly desirable for bees but I do not believe that species out of keeping with an area should be used indiscriminately. Indigenous species fit naturally to soil types while some introduced varieties blend well in most localities because they have been with us long enough to be regarded as natives.

Habitat for bees

Animals, wild and domestic—including man—need to be guarded against but undoubtedly the greatest hazards to planting schemes on the farm and on roadside verges in predominantly cereal areas are the effects of hormone spray drift and fire damage, both in theory avoidable but in practice frequent. Mature trees may well tolerate a certain amount of damage but new plantings must have a reasonable chance to become established without constant setbacks from partial defoliation. Information on the effect of hormone drift on non-commercial trees is very limited but there is visible evidence in the countryside that quite large trees suffer from drift and small annual applications of hormones may well prove fatal in time. Among the most sensitive are the willows (*Salix* spp) and poplars (*Populus* spp) which provide valuable spring pollen for honeybee colonies. In some years female willows yield considerable nectar, so conditioning colonies for the fruit blossom to follow.

The principal hardwood trees including oak, ash, elm and beech can provide spring pollen; they have the added value as timber although it is questionable if this matters in conservation or amenity plantings of the 1970s.

The three commonest trees for nectar are the sycamore, horse chestnut and lime. All are attractive trees and capable of providing surplus nectar. Usually the sycamore and horse chestnut combine with hawthorn which in itself provides a magnificent floral display, but is only spasmodic in secreting nectar and yields well about one year in seven. Sycamore honey in pure form lacks quality and needs the flavour provided by other sources; it can form the main spring honey flow in some areas.

The limes, which yield well, often in combination with clover, stand supreme in the production of quality honey for the main honey flow. Once a popular street tree, they are out of favour due to early leaf fall and tendency to foul pavements by honeydew production; most are too large for street use and are mercilessly pruned which limits their flowering.

The season can be extended from mid-June to the end of July using *Tilia platyphyllos*, or its variety *asplenifolia;* T. *vulgaris*, *cordata*, *maximowicziana*, *insularis* and *euchlora*. There are other less common varieties equally valuable, while three late flowering species *T. petiolaris*, *tomentosa* and *orbicularis* are recorded as being sometimes toxic to bees and should possibly be avoided. Bumble bees seem to be more susceptible than hive bees in seasons when toxicity occurs.

T. cordata, the small leafed lime, occurs wild in some parts of England and regrettably is not often planted. It appears to be a relic from our warmer climatic past when lime forests were more extensive in this country. There are three varieties *T. mongolica* (early), *euchlora* (mid) and *miqueliana* (late) which are of moderate size and suitable for roadsides.

Some of the more exotic species worth considering as nectar sources are the Maples (*Acer* spp), the Tulip Tree (*Liriodendron*), the Buckeyes (*Aesculus*), the Locusts (*Gleditschia*), the Acacias (*Robinia*) and the Judas Tree (*Cercis*). All of the single flowering Prunus and Pyrus species have value for nectar and pollen. As well as the timber trees previously mentioned, one can include alder, birch, hornbeam, walnut and sweet chestnut as pollen sources. It may, however, be advisable to check on the soil suitability for some of the imported nectar-bearing trees.

Conclusion

Although fines may be imposed for contravention of Tree Preservation Orders it is to be hoped that the dangers to perimeter plantings will be avoided by discussion and good neighbourliness.

The conservation movement of the 1970s should provide the stimulus to give enough conserved areas to maintain a satisfactory balance in the future.

It should be possible, without reducing the efficiency of agriculture, for private effort to contribute as much to the aesthetic merit of the countryside in general as Capability Brown did in particular.

Most trees outlive us and planting them implies a faith in the future.

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A graduate of the University of Nottingham School of Agriculture, he is a third generation beekeeper. He is known nationally as a lecturer on beekeeping.

D. I. Chalmers

J. Glyn Jones

Sugar Beet Top Silage

The rapid introduction of mobile pea viners in East Norfolk is eliminating the basic winter feed of pea haulm silage. What is the alternative?

Parallel developments in sugar beet harvesting machinery and the introduction of multi-row systems have made beet tops a realistic alternative to pea haulm. The major problems of mechanical lifting and soil contamination are greatly reduced.

This combination of factors applies in a relatively small area but the interest stimulated in sugar beet top silage could have much wider implications since there are some 4 million tons of tops available per annum nationally.

For many years pea haulm silage, a by-product from the pea processing industry, has formed the basic winter feed for dairy and beef cattle in East Norfolk. The haulm was cut and carted to a vining station and thrashed by stationary viners. It was then returned to the farm and either spread on the fields or made into silage. Farmers had come to depend on this cheap and reliable fodder more than they realized. In many cases they were able to collect haulm from the stationary viners in excess of their own quota and as a consequence were 'buying' forage acres.

Generally the silage produced was not of high quality. The haulm was readily available and cheap, frequently the only charge being haulage from the vining station to the farm where it was made, with precious little care, into uncovered surface stacks.

Stockkeeping in the area is associated with unploughable or intensively stocked rotational grassland with little attempt at conservation. Under this system pea haulm provided a reliable material which made into silage.

During 1968 a change in policy of the freezing and canning companies led to a rapid change from stationary to mobile viners. The 1970 season will see 80 per cent of pea acreage harvested by mobile units and at the same

time a virtual loss of the haulm suitable for silage. The haulm delivered from the mobile unit is so fragmented and scattered as to be unsuitable for collection with present machinery, although it should not be beyond the wit of man to devise a collection technique in the future. This rapid turn of events has left farmers with the urgent need to look for alternative winter feeds.

Alternative feeds

A wealth of other arable by-products is available to farmers in East Norfolk—sprout stalks from the freezing plants, stockfeed potatoes, carrots, parsnips and beet tops. Above all else and particularly for the post-Christmas period the stockman requires a reliable supply of feed; the supply of these materials, depending on the trade, is often variable. This search for a basic winter feed has led to a more critical look at the output from grassland in the area. A recent local survey of grassland use showed stocking rates to be 1·5 acres (0·6 hectares) per livestock unit, but in many cases this acreage provided only grazing, as pea haulm silage formed the winter forage.

There is potential for better grassland management to allow for more conservation, particularly as silage. In the past silage making has clashed with sugar beet hoeing, but monogerm seed and precision drilling have reduced the labour peak in late May; therefore grass silage becomes a more realistic proposition.

The equivalent values of some alternative winter forages (providing half maintenance) to 12 lb (5·4 kilos) of average hay are:

40 lb (18 kg) kale;
45 lb (20·5 kg) pea haulm silage, or fresh sugar beet tops, or sprout stalks and tops, or grass silage;
50 lb (22·7 kg) beet top silage; or
55 lb (25 kg) cabbage.

Surplus protein would allow 4 lb (1·8 kg) of cereals to be fed for the first gallon.

Despite this wide range of feed, farmers are naturally reluctant to put arable acres down to forage crops. The cost of doing so is high and brings home the unappreciated value of the pea haulm silage. However, one item which has stimulated much interest during 1969 is sugar beet top silage, primarily because of the change taking place in sugar beet harvesting.

Beet top silage

To date most sugar beet growers in Norfolk have relied on single-row tanker harvesters, which deposit tops (comprising crown and leaves) in a single swath. Although the tops can be mechanically collected it is slow work and results in a great deal of soil contamination. Tops can be elevated to an accompanying trailer but this is not a popular method. The recent introduction of multi-row beet harvesters for reasons of greater output per man, quicker harvesting and less traction difficulties and associated soil structure damage, has revolutionized the approach to beet top collection. The fundamental advantage of this system is that tops are put in a windrow, this means that they can be collected mechanically at reasonable speed and with low soil contamination.

The high initial cost of multi-row systems has restricted their adoption to large growers and co-operative groups. Nevertheless sufficient acreage is involved to make beet top silage a feasible proposition on many farms.

Harvesting sugar beet with a two-row self propelled harvester

Up to now the major problems for making beet top silage have been the collection of tops and soil contamination. The silica content should normally be under 10 per cent but may range as high as 40 per cent on a dry matter basis. Figures in the following table illustrate this for silages made in 1969:

Analysis—Sugar beet top silages 1969

	Fresh tops	*Silage*								*Average 1961 N.A.A.S. survey*
Dry matter %	19	19·7	25·0	29·7	17·8	17·0	14·1	13·8	24·5	15·5
Crude protein on dry matter %	11·7	10·6	10·5	8·0	12·4	12·5	20·3	18·4	9·5	15·3
Silica %	—	9·6	29·0	39·9	9·7	13·5	6·6	8·3	30·0	9·2
Acidity (pH) ..	—	3·8	4·0	3·9	4·0	4·2	4·7	4·5	4·0	—
Starch equivalent (estimated) ..	—	9·0	8·0	8·5	7·2	7·8	7·0	7·0	9·0	—
Digestible crude protein (estimated) ..	—	1·3	1·6	1·4	1·6	1·2	1·7	1·6	1·2	—

The collection from the larger windrows (up to six rows of tops) can be done by the loader unit of the multi-stage harvester or, alternatively, by the now obsolete side elevator-loaders originally used for pea haulm. The increased speed of work using these new systems allows delivery permits to be completed much more quickly and often the same labour gang can be used for the collection of tops. One other advantage, although not yet taken up on a big scale, is that tops can be sold off the field for collection and made into silage by farmers without beet quotas, or by those whose tops are not so easily collected. In other words, this crop lends itself to being a direct substitute for pea haulm silage.

Fresh tops are frequently fed in the field while conditions permit. As soon as the weather deteriorates and livestock housed, tops are carted and fed indoors. In fact, tops can be fed up to mid-January or later depending on the occurrence of severe frosts. As beet harvested in late autumn is more likely to suffer from soil contamination, it is desirable to ensile tops from the early-lifted beet. This will partly overcome the very real problems of contamination.

Tackled in this manner and removed quickly it creates few husbandry problems and allows winter wheat to be drilled where necessary.

Additives

Traditionally tops are carted from field to clamp or stack and consolidation undertaken immediately and continuously to control fermentation within the mass. No additives have been applied to any of the silos we have seen. Experience has shown this to be unnecessary where the crown is ensiled with the leaves. In these circumstances, sufficient fermentable carbohydrates are present. American work has shown that the crown, although representing only 7–8 per cent of total beet weight, contains nearly 50 per cent of the total invert sugars. German beet growers include the crown with leaf for improved fermentation, but the Danes normally ensile the leaves only, which they remove by forage harvester.

From the limited work carried out last year there is some evidence to show that in cases where only the leaf is ensiled additives may be necessary to ensure satisfactory fermentation and to promote an adequate level of acidification. Additives, where justified, should be applied as formic acid, molasses, or calcium formate/sodium nitrite powder.

Effluent

Tops normally contain 80 per cent water, and the quantity of effluent produced can be a third of the volume of fresh tops ensiled. Continental experience has shown that this can amount to between 50–100 gallons of effluent produced per ton of fresh material ensiled, and this over a period of 10–14 days. It is, therefore, important that provision be made for the streams of black juice that normally drain from the silo to be led into a suitable soakaway or collection pit. It may be worth while laying two or three drains on the floor of the silo to help free drainage. The clamp should be covered and sealed with a plastic sheet anchored down with old tyres or bags of fertilizer. Wilting will reduce the amount of effluent produced and should be carried out whenever possible.

Conclusion

The present national sugar beet crop produces some four million tons of tops. Bearing in mind that an acre of beet yields 7–8 tons of fresh tops or 5–6 tons of silage the potential source of supplies of winter forage is evident. The adoption of sugar beet silage as part of the winter feeding programme will depend a great deal on how easily it fits into the farming system. As a result of increased technical progress with springtime work in sugar beet it may prove more convenient to make grass silage during early June than to cart sugar beet tops in October. Making silage of beet tops probably requires less know-how than that for any other feedingstuff. The equipment is simple. Moisture content may vary widely without affecting feed quality and spoilage is generally low even under the poorest of storage conditions. Whichever alternative Norfolk stockmen adopt, sugar beet top silage offers a very cheap and nutritious winter feed.

This article has been contributed by **D. I. Chalmers, B.Sc.Dip.Ag. (Cantab.)** who is the County Livestock Adviser for the N.A.A.S. in Norfolk. His co-author **J. Glyn Jones, B.Sc.,** is the District Agricultural Adviser for East Norfolk.

Zero-grazing can be less laborious than traditionally grazed fields with difficult access. This article is about a farmer who has made a successful venture in such a situation

Zero-grazing Dairy Cows

N. A. Morison **J. S. Leitch**

ZERO-GRAZING is still regarded by many as being only for pioneer farmers but this article relates to a situation that is different. In spite of controversial opinions Mr. Harrison of High Common Farm, Morpeth, Northumberland, decided that zero-grazing was the only course open to him if he was to remain in dairying at all.

The farm is pear-shaped with the buildings on the narrow end of the farm, and the outskirts of the rapidly developing town of Morpeth just over the hedge. Before 1968, the farm was 178 acres of which 62 were cereals and 116 grass; fifty Friesians and followers stocked this at 1·7 acres per livestock unit. In that year, forty acres were lost to a factory site and the town's new by-pass, and the remaining 138 acres were left isolated from the buildings by the land being developed; for this reason it was necessary to bring the grass to the cows.

Although the object of the zero-grazing on this farm is not to maximize the stocking rate, the fifty cows and followers are now kept on fifteen fewer acres (1·5 acres per livestock unit). Latterly, store calves have also been retained and will graze conventionally.

Equipment

The equipment bought for zero-grazing was a self-unloading trailer, an off-set flail forage harvester (hay being the winter feed for the cows) and four feeding troughs. A flail type forage harvester was chosen as Mr. Harrison considered a double chop machine would mash the grass excessively. Initially, the feeding troughs (12 ft long x 4 ft wide x 3 ft deep) stood in a 1½ acre sacrifice field; they were mounted on skids and moved when the surrounding area became excessively plunged. This was not really satisfactory so a concrete feeding area was laid behind the existing cowshed for the 1969 summer, sloping slightly so that urine and rain run to the edge and drain away. The sacrifice field relieves the cows from standing on concrete all day long. Unloading the grass is made more easy by standing the four feeding troughs in line.

Grass being discharged into feeding troughs

Daily routine

The cows are milked in a cowshed equipped with a pipeline milking system. At 7.30 a.m. the trailer is taken to the field, the forage harvester attached and the load cut. The grass is unloaded into the troughs during the milking period without the inconvenience of having cows around the troughs and machinery. The trailer is then loaded for the second time but left standing until the afternoon milking. This reduces the time taken for the afternoon feeding, which is especially useful at weekends. Feeding the cows takes one man 1½ hours per day—little longer than it took to walk the cows to and from the fields and to move the electric fence.

Waste

A surprisingly small amount of waste accumulates. Any uneaten grass left in the troughs in the morning is forked out on to the concrete; there is sufficient to bind the dung so that weekly cleaning operations can be performed with the fore-end loader. About 2¼ tons of waste accumulates each week, and this is heaped in a corner of the sacrifice field until autumn when it is all spread.

Grassland management

A modest fertilizer usage—90–150 units of nitrogen per acre—provides adequate grass. In the summer of 1970, when home-bred Friesian stores are grazing, there will be still fewer acres available for cutting and heavier nitrogen applications will be necessary.

Poaching of gateways has been avoided, along with the subsequent risk of damage to cows udders. Sward damage due to tractor wheel spin is very slight, being encountered only in the early spring.

Rejection of certain species of grass and their subsequent predominance in the sward by the end of the season, as happens with *in situ* grazing, has not

been encountered. All grasses in the feeding trough are eaten; cocksfoot, when cut and mixed with the other grasses, is quite acceptable to the cows. In hayfields, it has been found that haymaking is easier if the outside five yards of the field are cut for zero-grazing.

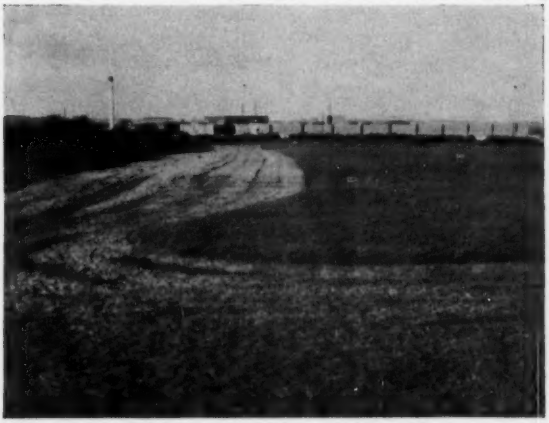
Feeding and milk yields

Daily dry matter intake of the cows depends upon the daily wet grass consumption and the dry matter of the grass. Records show considerable variation in

Net grass intake	105–208 lb/day	(average 136 lb/day)
and		
Gross dry matter	14·9%–28·8%	(average 22·4%)

In spite of these variations the daily dry matter intake of grass remains relatively constant, except for a significant increase during the eight weeks from the end of June to mid-August when grass digestibility is highest.

Milk Marketing Board records show a fall in average yield of 14 gallons (to 970 galls/cow) during the first year of zero-grazing. During the second year there was a further drop of 130 gal (to 840 gal/cow). Many factors influence milk yield. It is acknowledged that the later drop in yield was *partly due* to feeding over-mature grass. Probably more important was the partial replacement of hay with straw towards the end of the long 1968/69 winter. Concentrate feeding has not substantially changed since zero-grazing commenced and daily milk output has not fluctuated markedly. Mr. Harrison is confident that in the long-term good cow yields will be maintained.



Cutting conditions in late October with little wheel-damage evident

As grass is conserved as hay for winter feed, new equipment had to be purchased for zero-grazing. If silage was being made then the capital costs would be shared by the two uses of the equipment. Costs saved are those of electric fencing and the supply of water to distant fields.

Costs

	New price	*Economic life years*	*Annual annuity charge*
	£		£
Self-unloading trailer	525	5	137
Side mounted flail forage harvester ..	275	7	56
4 wooden feeding troughs	100	10	16
Concrete etc., extra rent			70
Repairs and running costs (estimated) ..			214
Total annual cost			£493
Cost per cow per year (approx.)			£10

Cow health and management

Lameness and intestinal worms have not, so far, been a problem as the cows have free access to a sacrifice field. Having the cows near the buildings all day makes it easier to detect cows on heat.

Conclusion

Mr. Harrison feels he was forced into zero-grazing by circumstances but he has found the system easy to work and less laborious than traditionally grazing fields with difficult access. In spite of the additional costs involved, he feels he could consider zero-grazing as a technique in a situation where he had a free choice of alternatives.

The authors of this article are **N. A. Morison, N.D.A.**, and **J. S. Leitch, B.Sc.(Hons.)**, of the National Agricultural Advisory Service, Alnwick, Northumberland.

PROFITABLE FARM ENTERPRISES

The latest booklets to be issued in the Ministry's 'Profitable Farm Enterprises' series are

No. 3 A System for Welsh Mountain Sheep, and
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Other booklets already issued in the series are No. 1—Rearing Friesian Dairy Heifers for Autumn Calving and No. 2—Three Systems for Beef using dairy calves and grass.

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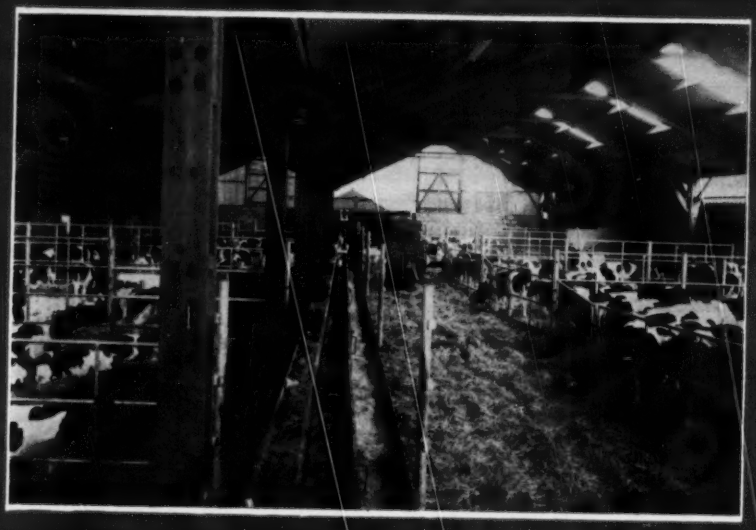
Housing Beef Cattle



This feature, on the provision and economics of beef cattle housing, contains articles by:

★ *J. J. Troon, A.R.I.C.S., Q.A.L.A.S.*, who is a Senior Assistant Land Commissioner with the Agricultural Land Service in Leicester.

★ *N. H. Nation, B.Sc.(Eng.), M.Inst.* consultant to the Farm Buildings Centre, Kenilworth, Warwickshire.

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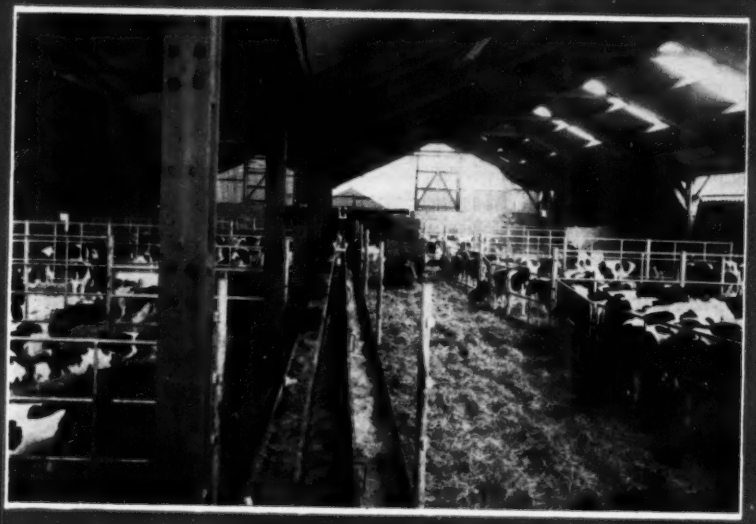

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★ N. H. Natos, B.Sc.(Est. Man.) consultant to the Farm Buildings Centre, Kenilworth, Warwickshire.

Housing of Beef Cattle

J. J. Troon

OF recent years in beef production there has been a swing away from systems of intensive concentrate feeding towards systems which use grass or grass products. With autumn and winter-born calves these systems require housing over two winters. This article considers loose housing of cattle during the second winter or finishing period in buildings where there is no attempt to achieve absolute control over the internal environment.

Requirements

The basic requirements of stock housing are the same for all systems, namely, adequate:

1. space for stock to feed, exercise and rest;
2. facilities for feeding and watering;
3. ventilation without draughts;
4. protection from extremes of climate;
5. lighting, both natural and artificial;
6. avoidance of conditions which may lead to disease or injury;
7. facilities for waste disposal;
8. facilities for handling and weighing stock.

Where restricted feeding is practised, up to 2 ft of trough length is required, although this may be reduced to 10 in. or 12 in. if food is always available on an *ad lib.* basis. There must, however, be sufficient depth behind the trough to enable the cattle to find a position at the trough on restricted feeding. A depth of 20 ft combined with a manger length of 2 ft gives the minimum space requirement of 40 sq. ft for each 18-month old beast. In all designs crossing a bedded area to fill the mangers should be avoided.

Wastes

Wastes may be handled as a solid, semi-solid or as a liquid and the decision on which method to use may well be influenced by any existing waste disposal methods on a particular holding. Economy of straw used as litter can be achieved by bedding only part of the yard and making the area adjoining the manger a solid floor. This allows the area to be scraped and the cattle to feed from a fixed level, avoiding the need for adjustable mangers to cope with the rising level of muck. If the waste is to be handled as a liquid the area adjoining the mangers can be slatted and the effluent stored beneath the slats. If the part-bedded area is strawed or silage or hay is fed there is a risk of long material getting through the slats; this will limit the methods that can be used for emptying the under-slat storage. Where the animals are loose housed on long litter it is not advisable to have both solid and liquid manure to handle, which would need extra disposal equipment.

Buildings with fully slatted floors have never been widely used, despite the capabilities of handling the effluent as a liquid. Although the *Codes of Recommendations for the Welfare of Livestock No. 1** make no reference to limiting the slatted area available to cattle, the original recommendation of the Brambell Committee on Animal Welfare that only half the area should be slatted may have had an inhibiting effect. However, the use of a slatted passage between two rows of cubicles enables the liquid effluent to be stored beneath the slats and maintains a balance between solid and slatted areas. A passage width of 8 ft combined with usual cubicle dimensions 7 ft long by 3 ft wide is effective. It should be noted that these dimensions give a superficial area of 48 sq. ft per beast and if half of a 4 ft wide central manger is included then the total area is 50 sq. ft per beast. In a part-bedded yard with 12 ft bedded area, an 8 ft feeding area and half of a 4 ft wide central manger give a superficial area of 44 sq. ft per beast. Experience has shown that slats 5 in. wide with a 1½ in. gap are satisfactory and that concrete slats are less slippery than steel slats. The slats should be designed to carry a load of 500 lb per sq. ft.

Feeding

The traditional self-feed system with the silage stored in a Dutch barn and the cattle housed on straw in an adjoining lean-to is still popular. Where this system is practised there should be 5 in. to 7 in. of silo face per head for a 24 hour access. Problems of ventilation can arise in this layout due to lack of sufficient outlet area because hay and straw is stacked on top of the silage. Even without this obstruction the building is frequently too wide to achieve adequate cross ventilation. In addition, the feeding of concentrates on a restricted basis will necessitate the provision of mangers. Unless these can be filled from outside the yard, an additional batch feed area will be required.

Ventilation

Ventilation is of prime importance in housing beef cattle. Excessive condensation results from inadequate ventilation which not only may affect the health of the cattle but may also seriously damage the structure over a period of time. With a climatically controlled building no attempt is made to keep the temperature within the building to confined limits and internal temperature will follow, with some delay, external temperature. Unless sufficient air movement and change is provided in cold conditions the moisture produced by the cattle will saturate the air and will condense out on the building fabric and structural members. The use of slatted boarding such as 4 in. x 1 in. boarding set vertically with ½ in. gaps will permit air movement without creating draughts. Condensation which occurs will usually take place on the spaced boarding which should be of pressure treated preserved timber. It is not advisable to take the spaced boarding right into corners since this can cause short circuiting and eddying of the air; the last 10 ft could be solid. In parts of the country and on some sites it may be sufficient to leave an open space for inlet ventilation. Gates in external walls should be sheeted to prevent draughts, and it may be necessary in exposed situations to enclose the space above the gateway with hinged framing and cladding. Small mesh

*Single copies are obtainable from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex. HA5 2DT.

plastic netting or coir lewing, properly supported, can also be used to reduce wind speed. Outlet ventilation at the ridge in pitched buildings is best provided in the form of an open ridge. If the building is excessively wide, poor atmospheric conditions may exist in the centre of the building. A width of 60 ft may be considered a reasonable practical limit, provided outlet ventilation is adequate. This width is sufficient for a centre feeding passage with cattle grouped on either side. However, the provision of a 10 ft wide centre feeding passage needs an effective extra 10 sq. ft per beast over and above a layout using the feeding area as a feeding passage.

Lighting

Natural lighting is best provided by means of roof lights on a basis of 1 sq. ft of roof light per 20 sq. ft of floor area. Electrical lighting installations are governed by the Regulations of the Institution of Electrical Engineers and the British Standard Code of Practice No. C.P. 325. For normal working not less than 40 watts of filament lighting should be allowed per 100 sq. ft of floor area.

Drinking facilities

Water should always be available to the cattle and can be provided by troughs or non-splash bowls. Water bowls of the float valve type are preferable to types operated by pressure plate valves; they should be served by a header tank to give a reserve supply. There is a tendency for cattle to use water bowls as rubbing posts, and to overcome this and to avoid cattle mucking in the bowl a guard rail and/or plinth should be provided. Ideally the bowls should be sited off the bedded area on a basis of one bowl to ten beasts. If it is necessary to site them on the bedded area both the bowl and the guard rail should be adjustable. An area of 3 sq. in. of water trough per beast is sufficient.

Weighing

Weighing the cattle may well be part of routine management and handling and holding facilities will be required for veterinary inspections. If numbers of cattle are involved the provision of permanent pens may be justified. Where a portable crush is used, full use should be made wherever possible of existing concrete areas for holding and drafting.

New buildings may be constructed in traditional materials of brick, stone or concrete block, or framed in steel, concrete or timber. Where muck level rises walling should be not less than 6 ft high but may be reduced to 4 ft where there is no muck build up. Above wall height the normal asbestos or metal claddings or, alternatively, materials such as exterior grade plywood or oil tempered hardboard may be used.

In the following article the economics of beef cattle are considered in detail and from this it will be seen that there is little scope for fancy construction where a new building is being erected for beef cattle only. If the building is capable of a summer use as well as for winter fattening, then an increase in capital cost could be justified. One method of keeping building costs low is to use a pole-type construction using sleeper walling and fittings. Properly treated with preservative these materials have a good structural life and lend themselves to farm construction.

A simple but substantial pole barn and lean-to cattle yard

Economics of Beef Housing

N. H. Noton

THE successful provision of new beef housing, or the successful adaptation of old buildings to accommodate beef animals, requires answers to a great many management and economic problems. These answers will have to be found in the light of individual farm circumstances. One of the most crucial of these will be the profit margin on beef stock and, in recent years, this has compared badly with many of the alternative enterprises.

When margins are tight the limit of justifiable expenditure on new buildings is correspondingly reduced. Unfortunately, it is easy to fall into the trap of assuming that the building and its cost can be tailored at will to fit these limits. If buildings are to be constructed soundly, there is a bare minimum below which costs cannot, commercially, be further reduced. When the objective is to provide buildings for beef which will be viable propositions, it is important to carefully estimate the realistic capital cost of the practical alternatives at the outset, and then to assess their effect on the economics of the beef enterprise concerned.

Some analyses on this basis were produced for an exhibit by the Ministry's Agricultural Land Service at the Royal Show 1970. Although they were limited in scope and were primarily aimed at focusing attention on the need for a careful investment analysis of projects, some interesting information emerged in a broad sense on the economics of beef housing. The exhibit was based on the results of four different methods of beef production recorded by the Meat and Livestock Commission.*

**Beef Production from Grass/Cereal Systems.* Beef Improvement Service—Technical Report 1970. 3*s.* 6*d.*

Updated Targets for Beef Systems. M.L.C. Newsletter, Beef Improvement Services, No. 5. April 1970. (free).

These publications are obtainable from the M.L.C., Queensway House, Bletchley, Bucks.

Each of the systems was assessed on the basis of its use with one of four different types of beef building. In total this resulted in sixteen combinations of 'Production Systems' and 'Building Design', each making different demands in terms of labour use, building and materials cost, and working capital in beef stock.

Production systems

The systems assessed were:

1. Winter finishing of stores. Purchase of stores at an average weight of 7 cwt 3 qtrs, fattening indoors on concentrates (6 cwt at £26 per ton), hay (5 cwt at £12 per ton), silage (2½ tons at £1 per ton). Finally sold at an average weight of 10 cwt 1 qtr.

2. Finishing suckled-calves. A system similar to the winter finishing of stores but with a calf entering the building at 5 cwt 3 qtrs average weight and sold at 9 cwt. Fed on silage (2 tons), hay (2 cwt), and fattening mix (10 cwt).

3. Semi-intensive grass/cereal beef. Autumn-born calves reared indoors for their first winter, grazed over the summer, and finished on conserved grass indoors during the second winter. Sold at 9 cwt. Whilst this requires buildings for calves and beef animals, the exhibit was concerned only with beef buildings and the gross margin and costs were allocated accordingly.

4. Intensive grass/cereal beef system. Summer-grazed stock finished intensively during the winter and sold at 8–8½ cwt average weight.

Production figures for each of these systems at premium levels of performance are listed in Table 1 on page 428, which also includes both the peak capital requirement and the average capital requirement for all the systems. To take into account variations in the standard of management, the buildings were also assessed using the average level of prices and production costs with a reduction in the Gross Margin of £7 per head.

Building design

The systems of buildings were selected to give a range from the least expensive type of open yard to a fully covered yard with mechanical feeding. The costs were carefully estimated by the Agricultural Land Service for each design, inclusive of contractor's profit, preliminaries and services, to a standard having regard to the need for sound construction and good appearance, consistent with simplicity and economy. Fodder storage, access areas and farmyard manure disposal constructions were not included. Table 2 shows these gross costs per head, and also the net cost after 40 per cent Farm Improvement Scheme Grant. The systems were:

(A) Open yard. Stocked at 70 sq. ft per head for systems (1), (2) and (3), and 60 sq. ft for (4) the smaller 12 month intensive beef. Cost per sq. ft: 10*s*. (rounded).

(B) Semi-covered yard. Stocked at 60 sq. ft per head for systems (1), (2) and (3) and 50 sq. ft per head for system (4). Cost per sq. ft: 15*s*. (rounded).

(C) Covered yard. Stocking density 50 sq. ft per head for systems (1), (2) and (3) and 40 sq. ft for system (4). Cost per sq. ft: 20*s*. (rounded).

(D) Covered yard with mechanical feeding. Stocking density 40 sq. ft per head for systems (1), (2) and (3), and 35 sq. ft for system (4). Cost per sq. ft: 30*s*. (rounded).

The depreciation on all these buildings was calculated on the basis of a ten-year planned life with no maintenance costs. This investment life accords with experience of building systems at the National Agriculture Centre, where it was found that the economic performance of new buildings reached a peak between ten and fifteen years, and that the allocation of longer planned lives was counter-balanced by the increases in maintenance costs which must be taken into account. In other words, the economic results calculated over longer periods would be similar.

Labour use

The total labour requirement within each building over the fattening period and the machinery used was estimated by the A.L.S. on the basis of work study data. Table 2 gives these costs in relation to each of the buildings and production systems.

Results

Table 3 shows the return on capital resulting from each of these combinations of buildings and systems. The calculations were based on the average working capital requirements (Table 1), and also included the working capital needed for labour.

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The results showed that the potential overall returns attainable from a combination of any one of the four types of finishing yards with either of the two more intensive beef production systems were satisfactory, and that provision of new buildings could be justified on economic grounds. Thus, on the basis of these returns and depending on individual requirements, practicality and availability of capital, the choice of buildings for these systems could range from an open yard at a nett cost to the farmer of about £18 per beast to a covered yard with mechanized feeding at around £35 nett cost per beast.

As regards the two more traditional beef production systems, after allowance was made for provision of new finishing buildings these showed minimal returns at a premium level of production and prohibitively low or nil returns at an average level. So for these, not even the cost of the open yard could be justified if judged by investment returns alone. Even at half the capital costs estimated for the buildings in Table 2 the returns would still be discouraging.

Fortunately, although the returns are relatively insensitive to changes in building costs they are very sensitive to changes in market prices.

Farmers adept at securing cheap calves or selling at top prices could boost their returns by 10 per cent by an extra £10 margin. Similarly, this extra added to the two more intensive systems would raise the return by some 16 per cent.

Comparing the different building designs in general terms, their return on capital is remarkably uniform whichever production system is used. This was despite considerable differences in capital cost and labour use (Table 2). These aspects have a counter-balancing effect on each other, low capital cost being associated with high labour use, and low labour demand with high capital cost.* The stocking density which can be attained in the different types of buildings is also an important factor.

Looking at the figures in more detail, only the semi-covered yard did not in at least one instance prove to be the most economic (see Table 3). The precise order relative to costs differs in almost every case depending on the type of production system used, showing that it is impossible to generalize about the different designs. The only firm conclusion that can be drawn is that any comparison of alternative designs for beef housing must be based on a specific production system and with a careful analysis of the labour use. On the evidence of this analysis it seems that if labour is known to be either available or at a high premium, or capital resources are limited, these factors can govern the decision and an optimum return can still be secured.

Whatever the choice of building the more intensive beef production systems give the higher potential return, although a factor generally associated with intensive methods is that the management and disease risks are also higher.

Marginal units

The introduction of small enterprises on top of an existing farming system is frequently made to absorb labour otherwise under-employed. A small beef unit might conveniently form one such extra enterprise. In this situation, whilst a full farm analysis might (or might not) show that a complete revision

*A similar effect among different designs of calf house system used was noted in *Calf Housing and Capital Planning, Farm Building Digest, Autumn 1968*. pp. 25–28.

of the farm plan (fully utilizing labour) would be more economic, for the purposes of assessing whether or not the extra beef unit is worth while the cost of labour must be omitted from the calculations as the cost is already being met by existing farm enterprises.

An analysis of the figures on this basis was found always to give an order of preference (A), (B), (C), (D) the most economic being an open yard, irrespective of the beef enterprise involved. As might be expected, this meant the cheapest building was the most favourable economic proposition despite being the most demanding on farm labour. This was because the cost of labour, being omitted from the calculations, did not depress the returns. Whether it is sensible to ignore labour usage when there is spare capacity during the winter depends on individual circumstances; but farmers are constantly having to economize on labour, so it would seem wise to opt for buildings which are efficient in this respect whenever possible.

Finally, the lowest building costs are associated with open or semi-covered yards. These may be impractical on some sites especially where climatical conditions are likely to be poor.

Conclusion

The need to critically examine both the financial and the practical aspects of new beef housing emerged very strongly from the analysis. The economic justification for new buildings or alterations should be based on a realistic assessment of the necessary capital in livestock and in buildings, on realistic budgets and on actual labour use.

Non-economic factors may well have an important bearing on the final decision but at least it should be taken in the full knowledge of the financial implications.

Table 1 **Production data (rounded figures)**

	System 1	*System* 2	*System* 3	*System* 4
	Winter finishing of stores	Finishing suckled calves	18-month beef autumn-born	Intensive beef
	£	£	£	£
Sale price/head with subsidy ..	109	96	93	92
Costs				
Calf (or store)	78	58	19	15
Mortality (average)	2	2	2	1
Roughage	—	—	2	1
Silage	3	2	11	12
Hay	3	1	2	2
Fattening mix (concs.)	8	13	12	23
Veterinary	2	2	3	3
Miscellaneous	3	2	—	—
Gross Margin	12	16	36	32
Gross margin over summer grazing and winter fattening period	12	16	24	32
Peak Capital requirement* ..	93	79	57	60
Average Capital requirement* ..	87	70	46	45

*excluding labour

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Table 2 **Building, labour and machinery costs**

		Type of Building A Open yard	B Semi-open yard	C Covered yard	D Covered yard with automatic feeding
Building costs					
All systems					
Cost per sq. ft	£	0·50	0·75	1·00	1·50
Systems 1, 2, 3					
Space per head	sq. ft	70	60	50	40
Gross cost per head	£	35	45	50	60
Net cost per head*	£	21	27	30	36
System 4					
Space per head	sq. ft	60	50	40	35
Gross cost per head	£	30	38	40	52
Net cost per head*	£	18	23	24	31
Labour and machinery costs (rounded)					
Systems 1, 2, 3					
Labour grazing	£	1	1	1	1
Labour in building	£	4	3	3	2
Machinery	£	2	2	1	1
Total	£	6·25	5·76	5·00	3·95
System 4					
Labour in building	£	7	7	4	3
Machinery	£	3	2	2	2
Total	£	9·90	9·10	6·00	4·50

*after 40 per cent Farm Improvement Scheme Grant

Table 3

Return on capital at average and premium levels of production

Percentage per system and type of building

	Average production System				*Premium production* System			
	1	2	3	4	1	2	3	4
A. Open yard	0	1	13*	20	4	9*	24*	31
B. Semi-covered yard	0	1	12	19	3	9	23	30
C. Covered yard	0	1	13	24*	4	9	23	35*
D. Covered yard—automatic feeding	0	2*	13	23	4*	9	22	34

*Best return per system

Acknowledgment

The economic data on systems of beef production was kindly supplied by J. B. Kilkenny, Beef Improvement Service, Meat and Livestock Commission.

Fixed Equipment of the Farm Leaflet No. 50, *Housing of Beef Cattle* contains useful information and advice on this subject. Copies are obtainable from H.M. Stationery Office (addresses on p. 450) or through any bookseller price 3*s.* 6*d.* (17½ p) (plus postage).

DANGEROUS GASES IN AGRICULTURE

A number of fatal accidents in recent years have shown that many farmers and farmworkers are unaware of the serious hazard presented by the concentration of toxic gases that can build up in tower silos and slurry pits.

Tower Silos

When a green crop is put into a silo it quickly begins to ferment and to give off gases. Work done at the National Institute of Agricultural Engineering during 1968 clearly showed that not only was there a lethal concentration of toxic gas in the silo on the morning following the day when filling took place but that the volume was considerable, so that the concentration was still above acceptable limits at a height of 15 feet from the lowest point of the silage face. Anyone entering the silo through an unloading hatch would have been surrounded by the gases and would have quickly lost consciousness.

It is difficult to test accurately for gases in a silo because of the problems of access and of locating pockets of gas lying on the uneven surfaces of the silage. No one should enter a silo during or after filling, but where it is essential to do so, e.g., to level the silage manually, the following procedure is suggested:

1. Go in the same day, immediately after the last load has been put in; *do not wait until the next morning.*
2. If you have to go in at any time after filling, thoroughly ventilate the silo first by opening all the hatches and running the blower for a reasonable period of, say, 30 minutes.

(Continued on next page)

3. After opening a hatch, quickly climb above it. In this way you will avoid gases that, because they are heavier than air, will flow through the hatch and down the unloading chute.
4. Wear a safety harness and have at least two colleagues at the end of the life-line in case you have to be rescued.
5. Provide a notice at each access warning of the presence of gas.

Similar problems in respect of gas can occur when moist grain is stored in a tower silo. Here again, as far as possible avoid entering the silo. If you have to go in, first ventilate thoroughly; wear a safety harness and have at least two colleagues at hand holding the rope. Remember, too, that with grain there is a further danger from drowning should the grain bridge and collapse suddenly under your weight as you move about on the surface.

Slurry Pits and Tanks

Gases from slurry pits can be dangerous to animals and concentrations fatal to man can also occur. During storage the bacterial decomposition of the slurry causes a breakdown in organic matter and the release of gases, some of which are heavier than air. The rate of breakdown varies with the temperature so that it is greatest during warm weather and, as might be expected, the heaviest concentrations occur when the slurry is being agitated. Adoption of the following recommendations will help to prevent accidents:

1. Do not allow slurry to rise to within 12 inches of the slats or covers.
2. Provide adequate ventilation when agitating the slurry.
3. Fit a manhole cover that cannot fall into the tank.
4. Provide a notice warning of the presence of gas.
5. Never enter a pit or tank until it has been thoroughly ventilated. Wear a safety harness and have at least two colleagues at the end of the life-line in case you have to be rescued.
6. Do not stand over the slats or near the tank openings when the slurry is being agitated or loaded into a spreader.
7. Fence or cover the pit to prevent children, workers or stock falling in.
8. Secure the suction hose of the slurry tanker so that it cannot fall into the pit or tank.

One further important point, applicable to both tower silos and slurry pits, is that one of the gases present may be flammable. Therefore smoking, or the use of a naked light, should not be permitted. Finally, anyone entering a silo or pit will be still further protected if, in addition to the safety harness, he uses an air-line breathing apparatus.

Employers should ensure that suitable equipment is available, that everyone knows the correct and safe procedure to follow, and that everything possible has been done to safeguard the lives of all concerned. Further advice and information about firms who can supply safety harness and air-line breathing apparatus is available from the local offices of the Ministry of Agriculture, Fisheries and Food.

If good seasonal weather forecasts can be made a few months ahead it should make a major impact on farm planning

Long Range Weather Forecasts

W. H. Hogg

In spite of modern techniques farmers are still very much at the mercy of the weather for some of their weather-dependent operations such as cultivation, haymaking and harvest. In the past their acute observation has led to the collection of many old sayings of weather lore; and some, but not all, of these are based on well-founded principles. Today farmers can use weather forecasts as a guide which they can add to or modify using their own local knowledge. At present only the daily forecasts are widely used, normally covering a period of about 24 hours with an outlook for a further 24-48 hours. These can be a great help in management, but for long-term planning it is the climate rather than the weather that is taken as a guide.

It has often been said that weather forecasting is as much an art as a science. Few forecasters will deny that there has been a good deal of truth in this, but the technological advances of the past few decades is placing emphasis on the scientific aspects. For example, satellites provide extra information about the present weather systems on our planet; and high speed computers can carry out the millions of calculations necessary to produce charts on which forecasts may be based. At the same time, our still rather sketchy knowledge of the general circulation of the atmosphere is improving and all of these factors lead us to hope for more accurate forecasts to cover a much longer period. Assuming that eventually we shall have reliable medium and long-range forecasts, it is interesting to speculate how farmers would use them. We can think of forecasts covering a week, a month and a season.

Weekly forecasting

There is at least the possibility that within the next decade we shall have forecasts covering a week. They will probably not be a series of accurate daily forecasts; for the first two or three days they may resemble our present daily forecasts but would tend to become more general towards the end of the period. A knowledge of what is likely over the next week could clearly make for easier management but it is not likely to affect long-term planning. When it is time to start weather-sensitive operations this extra knowledge of the future weather will allow the effects of possible delay to be more rationally assessed. For example, if grass is ready for cutting and the weather is marginal, weekly forecasts are clearly more useful for decision making than

daily forecasts. The timing of cultivations could be more smoothly arranged with a foreknowledge that the weather would be settled (or unsettled) for a week. Where irrigation is practised and the past weather suggests that water should soon be applied, to know whether it will continue dry throughout the week could decide whether watering is necessary. If water is becoming scarce it may be prudent to concentrate on some crops and leave others, taking into account the moisture sensitive stages of each.

Growers who use any method of frost protection would clearly like to know whether dangerous frosts within a week are likely. They could make sure that their equipment is in order and their supplies adequate, and perhaps would also be glad of the chance to rearrange their social life if faced with the possibility of a few nights out of bed.

A number of plant diseases tend to develop and spread more rapidly in certain weather. Potato blight is the best known, as it is favoured by the warm moist air which a meteorologist calls 'tropical maritime'. It is often possible to be fairly certain that Britain will be influenced by such air for a few days and if its occurrence or persistence in a week were accurately forecast it would be easier to apply timely sprays. The present potato blight forecasts issued by the Irish Meteorological Service attempt to forecast the arrival of potato blight weather; a similar service is provided in the Netherlands.

Monthly forecasting

At present the prospects of weather for the next thirty days are issued at the beginning and in the middle of each calendar month. To a large extent these are based on similar weather patterns which have occurred in the past, although full account is taken of special factors in the current weather of the northern hemisphere which could modify such a forecast; for example, the extent of snow cover over the continent or the amount of ice in Arctic waters may be potent factors for our weather during winter and spring. These monthly weather prospects cannot yet be phrased with any precision, and are intended to give only an estimate of whether it will be warmer or cooler than average, and wetter or drier. Within the limits of their aims the results are encouraging; between 75 and 80 per cent of the statements to date have shown at least moderate agreement with events. There is no doubt that farmers need considerably more precision before they can make much use of these forecasts and if this were attained there would be many useful applications.

On the whole, the number of days when it is possible to get on to the land depends on the rainfall, both the amount and the number of days on which it falls. Any monthly forecast which could give this information would ease the problem of management considerably. To know whether a spell of wet weather is likely to last a week or most of the month would permit far more rational deployment of resources.

Other effects would be felt at the beginning and end of the season. At the beginning of the season a foreknowledge of the temperature and sunshine and, therefore, of soil temperature, could well affect the date of sowing and planting—early potatoes are an obvious example. Towards the end of the season a good indication of likely harvest dates could affect the general pattern of work, or help decisions on storage which could spread market supplies more easily.

Seasonal forecasts

Seasonal forecasts are not yet with us, although a few trial forecasts of this nature have been made with varying degrees of success. The methods used are basically similar to those for monthly forecasts and it is hardly surprising that this approach failed for the summer of 1968 which followed a course not matched for eighty years or longer. If good seasonal forecasts can be made a few months ahead it should make a major impact on planning as opposed to management. As Professor Hudson pointed out some years ago, it would be theoretically possible to change varieties and perhaps to introduce new crops if this could be done without prejudice to the other activities on the farm. A forecast of a warm sunny summer would make the chances for maize in southern England look much more attractive—or a switch to oats might pay off in a wet summer. More generally, if a forecast permitted only approximate estimates of yields, acreages could be adjusted. On a national scale close estimates could be made of milk production some months ahead.

As with shorter period forecasts a knowledge of likely water requirements for irrigated crops would highlight possible difficulties well ahead, though perhaps not early enough to permit installation of plant for that season. The prospect of shortages of water for irrigated crops would certainly encourage a more rational approach in its application, at the best time and in the right quantities. If the knowledge were early enough, varieties which demand less water could be sown.

Fertilizer timing could be related to future weather as well as to the past. At present, spring dressings are varied in the light of winter rainfall but if a wet spring is expected to follow a wet winter, the application of nitrogen could be further delayed.

Forecasts of a hard winter would encourage conservation of fodder, particularly if an early finish to grazing were expected in the autumn. Root crops could be harvested as soon as possible—perhaps a repetition of 1963, when pneumatic drills were used to free carrots from the frozen ground, could be avoided.

Conclusion

It is very difficult to assess just what effects accurate long-term forecasts would have on the farm. To be used extensively in planning and management they would need to be at least as accurate as the present daily forecasts; if they failed badly the effects would be widespread and severe. On the other hand, the years in which they were reasonably accurate could yield handsome bonuses in production.

The author of this article, **W. H. Hogg, M.Sc.,** is a Principal Scientific Officer of the Meteorological Office. He is attached to the Ministry's Office at Bristol as the adviser on weather in the South West, the West Midlands and Wales.

Land Reform in Iran

(Part 2)

Professor D. R. Denman

Second Phase 1964

The Second Phase of the land reform programme followed the passage of an amending law later in 1962. Its focus was upon the villages retained by the landowners under the First Phase and each owner was given the option of acting in one or more of three ways. One way was to let the land to the share-croppers at cash rents based on average earnings and not necessarily in accordance with the local customary principles of assessment. An alternative was to sell the land to the share-croppers voluntarily according to the principles of price assessment already prescribed in the law. And the third way was to divide the land between landlord and share-cropper according to the proportions prevalent under local custom for the sharing of crop yields between the parties.

Special provision was made in this Second Phase amendment for *vaghf.* land. The land of religious endowments was to be let for ninety-nine years to the share-croppers at cash rents, reviewed every five years by the Ministry of Agriculture. Private endowments (*vaghf-e-khas*) were sold to the Government who invested the proceeds in other forms of wealth for the benefit of the beneficiaries.

Another feature of the Second Phase was the setting up of machinery whereby whole villages were incorporated under the management of village boards with representatives of the landowners and the farmers and joint nominees. The villagers held units of stock in these corporations and the village was managed as a single enterprise.

By June 1969, the reforms of the Second Phase had stabilized and clarified the position of 2,457,982 farming families which in the aggregate affected directly 12,073,067 individual people.

Third Phase 1968

There is reason to believe that of the three choices open to the landowners in the Second Phase, the renting of land to tenants for cash rents was the most popular. If this were not so, it would be difficult to explain the purpose of legislation passed in 1968 to inaugurate what can be identified as yet a Third Phase of the land reform programme. The weight of emphasis was squarely on the rented land and landlords were called upon to surrender what a few years previously they, with good reason, might have regarded as Government recognized proprietary rights. Previously they could opt to rent the land of the retained villages to the erstwhile share-croppers; now,

after the 1968 legislation, they are required to sell it to the tenants. A new formula was introduced to determine the purchase price; it is ten times the annual rent reserved payable as a lump sum or over twelve years plus 20 per cent by way of interest. Certain provisions are also made under this, the Third Phase, to enable whole villages to be shared out between landlords and tenants on the local share-cropping proportions.

Critical role of rural co-operatives

From the beginning of the great and successful drive towards land reform in 1962, the establishment of rural co-operative societies in the reformed villages was an integral feature of the programme. Indeed, it was required of the share-cropper who was otherwise eligible as a recipient of land under the land reform that he join the village rural co-operative society—if he did not do so he forfeited his rights to the allocation of the land. In recent years, some of the smaller co-operatives have been amalgamated into larger concerns in the interests of efficiency of working. By the end of 1968, some 8,644 co-operatives had been formed and they have come to play a central part in the newly emancipated villages, offering facilities for credit and for the purchase of fertilizers and other necessities as well as funds for capital improvements, especially wells and *qanat*. In some villages, schools and mosques have been financed by the new co-operatives. The very latest move, this year, has been the creation of the Agricultural Co-operative Bank.

Cultural houses and social insurance

The land reform movement has in the last twelve months or so brought what can best be thought of as supporting and collateral developments. Land reform and the co-operative movement are novelties, the full significance of which is not readily understood by the traditional, working share-cropper who has come into a new responsibility towards the land. Instruction on adult lines was needed on these and other aspects of rural life in modern Iran. Consequently, the Shahanshah ordered the setting up of a National Association of Rural Cultural Houses, under which some 75 Cultural Houses have been established in selected villages. Strides are also being taken to introduce a comprehensive scheme of social insurance for the holders of the distributed *nasaq* land of the villages. The aim is family insurance against the consequences of sickness, disability and death.

Farm corporations

The most dramatic of the recent side effects of the national movement, however, is the creation of what are known as farm corporations. The objective is to introduce into the villages ways and means of capturing the benefits of very large scale agricultural enterprise. Two or more villages are incorporated in a farm corporation, in which the holders of the recently distributed *nasaq* are given shares. Some twenty such corporations have been established and they are responsible for the management and farming of the lands of the jointly held villages. This innovation is at present looked upon as an experiment and the scheme faces many difficulties of a social and managerial kind. Provided this principle of voluntary participation, which is fundamental to the thinking of the Government, is maintained the experiment could yield some useful results.

Rural Research Centre

The note of experimentation struck over farm corporations, is a key to the statesmanlike conduct of those responsible for these gigantic reforms in Iran. The farm corporation could be looked upon as a huge research project in empirical study. The authorities want to know the facts. This spirit has led to the capping act—the setting up in 1969 of a full dress Rural Research Centre to investigate with Government and Universities the problems of land reform, rural co-operation and the collateral developments such as farm corporations. Moreover, this new Centre is no domestic affair; His Excellency Dr. Valian, the Minister of Land Reform and Rural Co-operation, has a far wider vision. The new Centre should come to serve as a study centre for the Middle East and beyond and will be linked with other centres and universities in Europe and elsewhere, in particular with the Department of Land Economy of the University of Cambridge.

Land Reform in Iran (Part I) appeared in the August issue.

Extension of the Agricultural Chemicals Approval Scheme

Until recently the Agricultural Chemicals Approval Scheme related only to products used for the control of plant pests and diseases, for the destruction of weeds, and for growth regulation and certain other crop protection purposes. Following representations from Industry, however, the Scheme has been extended to include products available to farmers for the protection of stored grain against insect and mite pests.

The general administration of the extended Scheme will continue to be undertaken by the Agricultural Chemicals Approval Organisation at the Plant Pathology Laboratory, Harpenden. Requests for approval of grain protection products will, however, be passed on to an 'Approvals Section' at the Ministry's Pest Infestation Control Laboratory, and this section will deal directly with firms on all scientific aspects of approval.

It is expected that grain protection products will appear for the first time in the 1971 list of Approved Products, to be published next February, but these products can receive approval from 1st October 1970.

Britain's Countryside is a masterpiece of produced beauty
Henry James

To guide and create a satisfactory and agreeable environment we must avoid unnecessary destruction by co-ordinating

Management and Conservation

D. M. Sims

SOME degree of conflict between farming and wildlife conservation is probably inevitable. What also has to be accepted is the inevitability of change. One of the greatest difficulties is to convince the preservationists that nature does not stand still. There is a continuous process of evolution going on around us and what they seek to preserve is a particular stage in this process.

Our countryside

Most of us in Britain think our countryside is the most beautiful landscape in the world—what Henry James called 'a masterpiece of produced beauty'. The countryside in Britain is still largely the physical expression of a way of life of a past age; of cheap and plentiful labour and a disparity between rich and poor that would be intolerable today. It is the product, too, of the system of land tenure of that age, of landowners owning large tracts of the countryside let in small units to farming tenants. It was the landowners that created the countryside as we know it, and the farmers who cared for it. Both deserve our thanks and our praise.

Farmland

Today more than half of our farmland is owner occupied. The landowners of the past were comparatively affluent and well able to afford the creation and maintenance of a beautiful rural scene and, by happy chance or perhaps by design, a landscape in which wildlife was able to flourish. Few owner-occupiers of farms today are affluent and, for most, the financial reward of their endeavours as owners and occupiers of farms is disappointingly poor.

Management, therefore, increasingly has to be directed solely to profit. The agricultural industry is rightly proud of its record in increased productivity more so than most urban industry. It derives from improved techniques and methods, a steady and dramatic reduction in the labour force, and an equally dramatic increase in mechanization. Britain can claim to be the most highly mechanized farming country in the world if the number of tractors, etc. per unit area is the criterion. Yet mechanization, to be fully efficient, requires full utilization of the machine. Large field sizes become desirable and necessary; larger farm units equally so.

Change in ownership of farmland, and in the size of farms, is of profound social and visual significance. Seventy years ago, at the turn of the century,

only 15 per cent of farms were owner occupied. Today the figure is rather more than 60 per cent. The average size of all farms has increased from fifty to eighty acres, but more significant is the recent rapid growth in the number of farms of more than 300 acres. Up to 300 acres the number of farms is declining in all size groups, whereas all size groups over 300 acres are becoming more numerous. The rate of this change is increasing and is fastest in the largest size groups. The number of farms in the groups of more than 500 acres has increased by over 40 per cent in the past ten years. Today, over one-third of the area of crops and grass in England and Wales is farmed in units of more than 300 acres, and there is no reason to doubt that the proportion will continue to rise.

Hedgerows

This in itself will change the scale of the landscape since, with management in large units, the fields, windbreaks, roads and buildings have to be altered to suit a different and enlarged scale of capital investment, production and mechanization. The inherited pattern of hedgerows, created in days of horse-power and hand labour, frustrate the use of modern field machinery and modern agricultural techniques. The economic value of hedgerow removal can be clearly demonstrated, at least on the arable farm.

It is surprising that the extent of hedgerows is not known. The best estimate—made by the Forestry Commission on the basis of a survey carried out between 1954 and 1957 and published in the Royal Forestry Society's Journal* eight years ago—put the total length of field boundaries in Britain at just short of a million miles, of which nearly two-thirds were hedges. Cumberland was estimated to have 20,000 miles of field boundaries, 13½ miles per square mile, of which 50 per cent were hedges. Devon had 53,000 miles, 20 miles per square mile, and 86 per cent hedges.

Even with mechanized hedge trimming the cost per acre of maintaining hedges, say £40 a mile a year, needs justification in the farm accounts: particularly as the hedgerows may occupy at least one-fortieth, perhaps two or three times as much, of the farm area.

The cost of creating forty acre fields over an area where the existing field size is around ten acres would frequently be worthwhile. Such an operation would just about halve the length of field boundaries (from about 16 miles per square mile to about 8 miles per square mile). It is a pattern of change that is not unlikely.

In countryside where there is not much woodland, the hedgerow is probably the most important habitat for wildlife and its disappearance is, therefore, a matter of concern. The retention of a network, albeit on a larger grid, is very desirable.

On tenanted farms hedgerow removal will usually require landlord's consent. The policy of some landlords is to require the planting of woodland to replace the hedgerows in the landscape and, with an increasing awareness of the effect of hedgerow removal both on the landscape and wildlife, the practice is likely to increase. New woodland, planted for shelter, for sporting and for amenity may well replace the existing hedgerow network and supple-

*Locke, G. M. 1962. A sample survey of field and other boundaries in Great Britain—Q. Jl. For 56: 137–44.

ment those hedgerows that remain. Hopefully, one may look to an increased value for sporting to pay for this otherwise unprofitable planting. Certainly there is an evident potential for such development in many parts of the country. It seems likely that the deliberate improvement of the terrain for sporting purposes would be entirely consistent with wildlife conservation.

Management

Too often, the management decisions that affect conservation have to be taken within the confines of the single farm unit: and many farms are small and their returns low. The hedgerow occupies space that could be devoted to crops and it costs money to maintain and brings little or no benefit. The trees in the hedgerow may have a value for sale. The small piece of woodland, tolerated and even enjoyed when affluence will permit, can be grubbed and brought into farm use at relatively little cost, and with a resulting increase in size of the farm. With the same end in view, land presently too wet to be productive but conceivably of importance in the conservation sense, can be drained.

Conflict between farming and conservation derives mainly from two causes, poverty and ignorance. Prosperous farming, economically able to refrain from actions harmful to the conservation interest and knowledgeable about conservation, could largely avoid conflict. We certainly need to know a great deal more than we do about what, from the conservation point of view, is important, desirable to retain or to create; and what relatively is of less importance, less harmful or even not harmful at all. The farmer is not a vandal, but he is often woefully ignorant about wildlife and so are most of us. Management can take account only of matters and considerations of which it is aware, and only to the extent of one's knowledge.

Those who are concerned with the effect on the scenery of our countryside of present trends in farming might be reminded that this is, to quote the late Dudley Stamp, 'Only a partial return to a pre-enclosure scenery, a roomy landscape with a greater spaciousness'. The real problem is how to avoid unnecessary destruction; how to guide and create a satisfactory and agreeable environment; how to reconcile conservation and beauty with inevitable change.

The appearance of the landscape will change during the rest of this century, perhaps more dramatically than at any other period of history within the span of one generation. Urban growth will swallow a million acres, quite possibly more, and much of this for new or vastly expanded towns—even new cities. No town is an island. A new town generates commuters in nearby villages and the new town dwellers seek recreation in the adjoining countryside. The pressures engulfing villages and countryside are immense.

Perhaps the management considerations that are of the greatest importance to conservation are those concerning the broad land use pattern of the countryside rather than within individual farms. The increase in mobility and in leisure of the great mass of population will inevitably require provision in the countryside for recreational pursuits.

Conceivably such country parks and, more generally, the setting aside of areas for recreation rather than for farming would, from the conservation point of view, be likely to more than compensate for any loss in the farming areas. Such a concept is also not without its problems.

Role of conservation

To quote the late Dudley Stamp once more (Nature Conservation in Britain, 1969), 'The essential is a continuing and continuous collaboration in which nature conservation has a double role to play: that of providing the scientific guidance relative to man's position against the background of his natural environment, coupled with the task of fostering the national pride of the British public in the native fauna and flora and so of making due provision for their conservation'. In other words, a better understanding and a willingness to pay.

This article has been contributed by **D. M. Sims, F.R.I.C.S.** who is Regional Land Commissioner for the Ministry of Agriculture, Fisheries and Food in the Northern Region.

The Ministry's Publications

Since the list published in the August, 1970 issue of *Agriculture* (p. 379) the following publications have been issued.

MAJOR PUBLICATIONS

BULLETINS

No. 20. Beneficial Insects and Mites (Revised) 17*s.* (by post 17*s.* 8*d.*)
(SBN 11 240320 4)

No. 95. Strawberries (Revised) 10*s.* 6*d.* (by post 11*s.* 2*d.*)
(SBN 11 240395 6)

No. 152. Intensive Management for Egg Production (Revised) 9*s.* 6*d.* (by post 10*s.*)
(SBN 11 240452 9)

F.E.F. LEAFLETS

No. 11. Farm and Estate Hedges (Revised) 2*s.* 9*d.* (by post 3*s.* 1*d.*)
(SBN 11 240551 7)

No. 50. Housing of Beef Cattle (New) 3*s.* 6*d.* (by post 3*s.* 10*d.*)
(SBN 11 240590 8)

MECHANIZATION LEAFLET

No. 27. Glasshouse Heating Systems (New) 1*s.* 9*d.* (by post 2*s.* 1*d.*)
(SBN 11 240684 X)

FREE ISSUES

ADVISORY LEAFLETS

No. 99. Powdery Scab of Potatoes (Revised)
No. 297. Sweet Corn (Revised)
No. 304. Cereal Take-all (Revised)
No. 305. Bryobia Mites (Revised)
No. 391. Preparation of Strawberries for Market (Revised)
No. 427. Feeding Turkeys for Meat Production (Revised)
No. 448. Hay: Quality and Feeding (Revised)
No. 471. Loam Based Seed and Potting Composts (Revised)

SHORT TERM LEAFLETS

No. 15. Chemical Weed Control in Top Fruit Orchards (Revised)
No. 23. Chemical Weed Control in Strawberries (Revised)
No. 101. Phosphate on Grassland (New)
No. 105. Straw Substrates for the Production of Crops in Greenhouses (New)

Priced publications are obtainable from Government Bookshops (addresses on p. 450) or through any bookseller. Single copies of the free items are obtainable from the Ministry of Agriculture, Fisheries and Food, (Publications), Tolcarne Drive, Pinner, Middlesex. HA5 2DT.

38. South East Shropshire —Bridgnorth

P. E. Knight

SOUTH East Shropshire lies astride the Severn. To the west the area is enclosed by the Wyre Forest, the Clee Hills rising to over 1,700 feet, and the escarpment of Wenlock Edge. East of the river there are no distinct natural boundaries as the area merges into the Shropshire-Staffordshire arable belt.

Bridgnorth is the focal point of this corner of Shropshire. Its bridge is the only road crossing of the river in twenty miles. An increasing proportion of its rising population travels to the Wolverhampton area which is sixteen miles away. Bridgnorth has few large factories. Carpet making is old established; other more recent industries manufacture aluminium sheet, electrical components and precast concrete pipes. Agricultural merchanting and servicing comprise most of the smaller businesses and the livestock market is one of the largest in the Midlands.

Old iron forges and furnaces can be found in the rural areas below the Clees which were worked until Abraham Darby built forges at Coalbrookdale, Broseley and Bridgnorth. Ironstone and limestone came from the hills and charcoal from the Wyre Forest. Coalbrookdale, the cradle of the Industrial revolution, lies eight miles north of Bridgnorth and will be absorbed by the new town of Telford.

West of Severn

Away from the river, to the west, the land rises from 250 feet to the skirt of the Clees at about 900 feet. Few fields are too steep to plough. Soils are mainly silt loams derived from Old Red Sandstone but there are areas of sandy loams from the Middle Coal Measures and silt loams over siltstones and mudstones. The silt soils are difficult to handle and slow to warm up in the spring; with 30–32 inches of rain, poaching can be severe. The winters are long.

Farms are medium-sized, averaging about 150 acres, and farming was traditionally livestock rearing with a small acreage of roots and corn. Dairying has increased considerably since the dairy cow took possession in the 'thirties, although rearing and fattening beef cattle and fat lamb production are still of great importance. Better grassland management has improved stocking rates and released land and led to a considerable increase in cereal acreage. Winter wheat is the traditional cereal crop; the area was long known as the 'Wheatlands'. The silty soils, wet autumns and more intensive cereal cropping has resulted in an increase in spring corn.

Higher up the Clees, Welsh and crossbred ewes graze the poor pastures, accompanied by a few hill cows and ponies. Around Titterstone Clee are many smallholdings enclosed by miners working at the coalpits higher up the hill. The last pit on the hill closed early this century, about the time Highley shaft was sunk. The miners and their descendants travelled the seven miles to the new pit until it, too, closed eighteen months ago. They returned each day to tend their stock and to keep back the gorse and birch which continually threatens the thin, hungry, poorly-drained soils on the small stony fields. The prospect of opencast mining on the common could bring back the winning of coal to the doorsteps of the old miners.

The arable east

East of the Severn lies an area of undulating arable land ranging from 150 to 400 feet above sea level with an average annual rainfall of 27 to 28 inches. Soils are sandy loams and loamy sands derived from Bunter sandstone and glacial and post glacial sands and gravels. Blowing occurs on the lightest land whilst drought can be a problem and farmers irrigate wherever possible.

Over half the farms are larger than 150 acres. Leys are mainly one-two year seeds for fat lamb production and yarded beef cattle, but farms with dairy herds have longer leys. Many farms have some land too steep to plough and these poor grazings burn severely in the summer, they carry the dry ewes, store cattle and the outdoor sow herds.

About a fifth of the ploughable land is under cash root crops. Early potatoes are grown and, if all goes well, are lifted immediately after the Pembrokeshire crop has been marketed. The sugar beet acreage has risen with the adoption of low labour techniques. The soil and climate is well suited to vegetable production but for many years they have been grown on a limited scale. Recently there has been an increase in acreage with a wider range of crops. Few crops are grown on contract, the main outlet for produce being the wholesale markets of the Midlands.

Will it Work?

E. R. Butler, *Agricultural Land Service, London*

BUILDINGS just don't happen. Many months of planning and designing go into some layouts, but others might just as well have 'happened' because they do not live up to expectations. Why is this?

Most people who design farm buildings are aware of how many square feet of space an animal requires; what temperature is desirable and what air circulation is necessary. But the man who has to carry out his work in these buildings, amongst the livestock, rarely receives such detailed consideration. Have you tried carrying a sack of meal to an *ad lib.* feeder whilst a hundred pigs mill around your legs? Or to scrape down a concrete yard with beasts wandering around all the time?

Methodical planning

When planning buildings remember that you are also planning work routines within that building. It is better first to consider what will go on within the building and how that will be achieved and then prepare a plan to fit it. Careful attention to detail on a plan pays off. It is easier to rub out a line on a plan than to knock down a block wall!

The Agricultural Land Service has for over ten years been interested in and concerned with method study in farm buildings. Method study is one of several techniques available for improving productivity; it is well used in other industries so why not in the agricultural industry? Many people who have heard or read about the technique think that it is useful only to improve a situation that already exists. But its step by step approach can be effectively used at the creative stage. Couple it with labour performance data and real benefits show from the start.

A case in point

A recent case study will help to illustrate these points. The farmer had decided upon a new building to house his sows and litters. Estimated costs indicated that, financially, it would be satisfactory. Detailed plans were drawn up and work was scheduled to start in three months. The farmer had worked out the space requirements correctly. Animal health factors were taken into account and so were safety requirements. The plan looked good, but when subjected to method study it was found that the physical and management constraints would prevent the pigman from doing his job properly in the time he had available.

Having obtained the necessary information from the farmer, a work routine was built up and times applied so that it could be shown how long the routine tasks would take. This showed that only if all went perfectly could the morning feeding and cleaning routines be finished in the available time.

On top of this there were still the regular, but less frequent, tasks of topping up bulk feed hoppers, strawing down pens and completely disinfecting them after every batch. Thus it became clear that much re-thinking was necessary.

Using information on labour task times it was demonstrated to the farmer that his ideas, if implemented, would cause the pigman some difficulty. To help with the problem the pigman was asked to give his suggestions. Consultation at the planning stage with the man who will work the system can frequently produce worthwhile ideas. This case was no exception.

The problem was to find how to fit the necessary tasks into the available time and to achieve a standard of management acceptable to the farmer. At the outset the farmer had made certain constraints because of finance, animal health and safety. These had led him to adopting a certain design. Critical examination showed that some of them were ill-founded and that others could be taken care of in different ways. The plan was modified and the time available became more than was necessary to carry out the required tasks. This meant more time for stockmanship, less fatigue and a happy pigman.

Achieving the purpose

How can you accomplish these things with any plans you may have? Quite easily, by asking yourself these questions:

(a) Am I sure that my objective cannot be reached without a building at all?

(b) What is to be done in the building?

(c) How is it to be carried out?

(d) Who is/will be responsible for doing it?

(e) When and with what frequency will work have to be done?

(f) Where will all the equipment be that is necessary to attain the desired objective?

Depending on the answers you should be able to prepare a plan best suited to your needs.

New Director for Glasshouse Crops Research Institute

The Governing Body of the Institute have announced the appointment of Dr. Rudd Jones, M.A., Ph.D. as Director of the Institute in succession to Mr. F. W. Toovey, O.B.E., B.Sc., A.R.C.S., A.I.C.T.A., who will be retiring on 31st March, 1971. Dr. Rudd Jones was educated at Whitgift, Repton and Emmanuel College, Cambridge and has, since 1959, been a Scientific Adviser to the Secretary of the Agricultural Research Council.

in brief

- **N.A.A.S. look at combine harvesting**
- **Integrated pest management**
- **Back to square one**

N.A.A.S. look at combine harvesting

You do not need a degree in economics to appreciate that any form of capital investment must be evaluated by its expected return. Farm capital, which because of certain differences in the nature of the *milieu* in which it operates, has necessarily to be subjected to a closer look than some other forms; and of all farm capital the combine harvester, by virtue of its costliness and seasonally restricted use, calls for special attention.

A report by the N.A.A.S. Liaison Unit at Wrest Park on an examination of the utilization and performance of combine harvesters, carried out by N.A.A.S. Mechanization Advisers over eight regions last season, does just that. Investment in harvesting and drying equipment (now held by most cereal farmers to be an indissoluble partnership) has grown apace in the past ten years. Whereas in 1958 combines in England and Wales totalled around 49,000, by 1968 the figure had risen to 60,300, half of which are in the 10–15 ft self-propelled class; grain driers of all kinds which totalled 13,000 in 1958, now top 35,000. The N.A.A.S. Mechanization Advisers set themselves to discover how effectively these juggernauts and accessories of the modern harvest field are being used.

In a spot check on rates of combine working very few farmers were found to be getting more than half the outputs claimed, and over two-thirds of the machines were working for less than 150 hours per season. Early harvesting is often outside the farmer's control, but this is one of the most significant factors affecting the length of the combining season on any particular farm. In terms of combine output a start in late July or early August may be twice as valuable as late September when the crop is under a heavy dew. Most farmers in the survey (60 per cent) did not judge their crops to be ready for combining until the moisture content of the grain was below 18 per cent; others varied their criteria between hardness of grain, necking of ears and colour of the straw. Now that so much grain is going for animal feeding, holding back the combines on the 18 per cent moisture content rule is less justifiable. As the report points out, at the end of a difficult harvest many farmers struggle on at over 22 per cent m.c. The cost of drying grain in early August is no greater than that in early September, but the cost of delaying the end of harvest by two weeks can be considerable in terms of extra grain loss. It is reasonable to suppose that where a farmer has grain drying facilities, harvesting would start earlier, but in fact, notwithstanding a trebling of the number of driers in the past decade, the investigation revealed no evidence of improved annual use of combines.

The amount of grain lost is another matter of concern, the survey showing an average threshing loss of around 50 lb per acre, made up of 7–10 lb drum loss, 7–10 lb sieve loss, and 25–30 lb walker loss. Header losses were particularly high—in barley, 84 lb/ac, which were double those in wheat. Variety and date of cutting

appear to have a marked influence, and the penalty for leaving barley an extra two weeks may be 2–3 cwt per acre. Commenting on this the report says 'Merely extending the use of a machine to deal with more acres at the end of the season could result in high header losses; any improvement in the general level of utilization must clearly come from other less risky action. One way is to drive the machine faster for the same length of time; another is to start combining earlier and to accept that drying will be essential. An early start to the harvest should minimize the risk of over-mature crops which are susceptible to shedding and header losses'.

This report, which is available free from the N.A.A.S. Liaison Unit, N.I.A.E. Silsoe, Beds, is one which cereal farmers should study closely if the end-of-the-season farm balance sheet is not to come up with some disagreeable revelations.

Integrated pest management

A GREAT deal of research and a great deal of money have been devoted to keeping our glasshouses clean of the various pests which find in them the ideal environment for their entire life cycles. A variety of chemical formulations and alternative methods of application have been placed in growers' hands and used at increasing cost in an attempt to overcome the marked ability which certain pests, like the red spider mite, display in producing resistant strains. A technique, described as integrated pest management which has been evolved at the Glasshouse Crops Research Institute, will therefore be of outstanding interest to glasshouse growers. Instead of full chemical control, the method is to introduce a predator to deal with the chief pest and reserve purely chemical measures of control—preferably soil applied systemics—for the less important pests and diseases. Against a normal average figure of £250 per acre per year for successive chemical treatments, the G.C.R.I. plan of integrated control would be expected to cost about half as much.

As regards red spider mite, for example, a Chilean predatory mite, *Phytoseiulus persimilis*, has been found to be a very effective agent of control. An even infestation of red spider is deliberately introduced into the glasshouse soon after planting, and ten days later the predator is released. In this way the predator population will have established itself by the time the red spider mites move from hibernation on to the plants. Earlier attempts at control by introducing the predator on to natural infestations *as they occurred* have often failed to have any significant result. The G.C.R.I. method gets predator and pest off to a natural cohabitation.

'The deliberate introduction of a pest is a new and unusual concept for the grower', said Dr. Nigel Scopes of the G.C.R.I. at a recent demonstration at Fernhurst. 'Our greatest problem is to discover a suitable method of producing the large number of predators required'. Admittedly this would be expensive, but then so is the bill the nation has to foot to keep glasshouse pests in check by what has come to be accepted as orthodox means.

Back to square one

INCREASING concern that the world is in danger of losing many species of wild plants is expressed in the current issue of *Span*. Under the influence of more sophisticated environments wild flora and related primitive plants all too readily succumb and may thus be lost to future plant breeders seeking new attributes or the strengthening of such factors as disease/pest resistance or higher yields. Any reduction in the size of the gene pool upon which the plant breeder may be able to draw is ultimately to restrict the potentialities of food and industrial crops for future peoples of the world. Old species and varieties quickly become extinct as new and improved sorts enter into everyday farming practice.

A panel of the International Biological Programme, which met in Rome last year, recognizing the urgency in this matter, has called for immediate action. First, a series of emergency scientific expeditions to collect primitive varieties of cultivated crops and their wild relatives; and second, a world survey during the next two years to establish which species and varieties already exist in botanical collections and where the gaps exist.

AGRIC

Books

In Search of Beef. A. FRASER, T. L. DODSWORTH, C. BALL and P. J. BROADBENT. Crosby Lockwood and Son, 1970. 30*s*. [£1·50].

Now that M.A.F.F. Bulletin No. 178—'Beef Production'—is going out of print, Young Farmers' Clubs and junior students may well turn to this book which could prove a thought provoking 'starter' for students of the beef industry.

In the brief space of 150 pages the authors make a bold attempt to cover the whole field of beef production from conception to consumer. Almost inevitably, the quartet is not always in complete harmony. There is a lack of balance in the composition and some sections, by the junior trio, have been over-condensed to the point of complexity; they will make heavy going for the beginner.

Dodsworth, Ball and Broadbent have done some really useful research work at Craibstone and were amongst the pioneers of 18-month beef. They might well have devoted more space to husbandry techniques and production systems and, in particular, to English work in their own special field. Allan Fraser's chapters are, as one would expect, particularly lucid and eminently readable even if, at times, his facts and figures are barely credible. His quoted weight for a prime veal calf, for instance, 160lb *live* at slaughter, compares with *carcases* of 200-260lb now generally sold on the London market. Knowledgeable readers may also question his estimate that calf mortality is running at 25 per cent or his suggestion that 'Hereford cows are, on average, better milkers than those of other specialized beef breeds'.

The book has a rudimentary index but a voluminous list of references for further study. The numerous black and white illustrations are of variable quality and one breed society will certainly feel aggrieved to be represented by a bull that was born some eight bovine generations ago.

F.J.W.

F.E.F. Leaflet No. 1—Cowhouses. MINISTRY OF AGRICULTURE, FISHERIES AND FOOD. H.M.S.O., 1970. 3*s*. 6*d*. [17½p].

The publication of a revised edition of this leaflet is a reminder, to any who may need it, that the cowhouse is still an important feature on the farm building scene.

Labour requirements in the management of a cowhouse exceed those of covered yards or cubicle buildings. The cowhouse gains, however, over individual attention to the cow and close control over the use of feedingstuffs.

There are cowhouses and cowhouses and one of the main points of difference in them is over cleaning-out arrangements. The leaflet sets out in particularly clear terms, the four different 'acceptable' ways of removing dung and urine. All are mechanized in some degree. From the information given, the individual will be able to decide on the best course of action for his particular case and pocket.

It is significant that the leaflet starts by stressing the importance of making the cowman's task straightforward and easy, 'in recognition of the fact that the health and comfort of the cow and standards of hygiene are dependent as much on him as on design'.

The single rank cowhouse which was so familiar in earlier days, is not even mentioned because high constructional costs rule it out. Traditionally most double rank cowsheds are 'tail-to-tail' in layout and this is stated to be still the cheapest arrangement. Convincing reasons are advanced, however, for the 'head-to-head' layout, with its advantages in everything to do with feeding.

The design features which in many ways highlight the extent to which views have changed over the years, is emphasized by the comment that 'Insulation of the roof is the surest way of providing suitable conditions for the cows and the cowman. . .'.

It is interesting to find that the choice between solid concrete divisions and steel tubed designs is still an open one. Single stalls are, however, strongly recommended.

The leaflet conforms to the high standard established in this series. There is no sitting on the fence, positive advice is given on all aspects of the subject. At the same time, the reader is given a fair statement of the options which are open in this particular field and no one could claim that the leaflet is in any way dogmatic.

W.G.B.

The Cuticles of Plants. J. T. MARTIN and B. E. JUNIPER, Edward Arnold, 1970. £7 10*s*. [£7·50].

New methods of identification of organic materials have recently become available and the scanning electron microscope now allows the contours of surfaces to be studied in detail. As a result there is much new information about the outer skin, or cuticle, of plants and the authors have seized the opportunity to compile this book.

It covers a wider field than the title suggests. It not only deals in some detail with the chemistry, morphology and function of the cuticle and cuticular waxes of leaves and fruits and with the techniques used in their study but it touches on a variety of other topics such as the epidermal wall, epidermis, bark, cork, pollen grains, chemotaxonomy, the physics of surface wetting, cuticular decay and paleobotany.

The book is attractive in appearance and carefully produced (although the caption to plate 12.11 is apparently in error). The electron micrographs of wax plates and tubes and the anecdotal items of physiological anatomy would interest an intelligent layman, although he may be deterred by the rather formal style, the exhaustive detail, and the price. Schoolteachers and others too may find it a useful source of somewhat 'off beat' information. Farther advances in this field are almost certain in the next few years and one may hope that the authors' evident enthusiasm will be infectious and inspire someone to find answers to the 'hows' and 'whys' to add to the present largely descriptive 'what'. The book can be recommended to anyone contemplating research on cuticles as an introductory background.

I.W.P.

books received

Milk Production Economics 1968-69. Retrospect and Prospect. Rosemary F. Walker. Department of Agricultural Economics, University of Manchester, 1970. 5*s*.

Farm Management Survey 1967-68 and 1968-69. Department of Agricultural Economics, University of Manchester, 1970. 5*s*.

Plant Breeding Institute Annual Report for 1969. Copies from the Plant Breeding Institute, Cambridge, CB2 2LQ. Price 10*s*. 6*d*. (post free). 1970.

Metrication Matters! Copies from the Royal Institution of Chartered Surveyors, 29 Lincoln's Inn Fields, London W.C.2. Price 10*s*. (8*s*. to members).

Agriculture, Forestry and Land Management. Copies from the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2. Price 4*s*. 1970.

The Soil Survey Annual Report for 1969. Copies from the Soil Survey of England and Wales, Rothamsted Experimental Station, Harpenden, Herts. Price 5*s*.

Dairy Farming in Dorset. V. H. Beynon and E. T. Davies. Department of Agricultural Economics, University of Exeter, 1970. 5*s*.

Grouse Management. The Game Conservancy. Published in association with The Nature Conservancy. 1970. 10*s*.

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